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Original Articles

THE TREATMENT OF DIFFERENT TYPES OF MALOCCLUSION WITH THE TWIN-WIRE MECHANISM

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IN A previous paper I endeavored to show the technique of constructing and manipulating the twin-wire mechanism. Here I shall present a number of cases worked with that appliance and shall show a few models of cases before and after its use. I believe, however, that you will learn more about the manipulation of the appliance if I present cases under actual treatment. The cases I shall show were photographed about every six or eight weeks during treatment.

One of the most prevalent types of neutroclusion is the one in which the canines are impacted. This condition is usually caused by an early loss of the deciduous molars, a situation which permits the first permanent molars to drift forward, closing up the space for the canines. However, some impacted canines are caused by a lack of forward growth in the premaxillary region. The two conditions can usually be differentiated by the general appearance of the patient, Fig. 1.

If there is a lack of premaxillary development, as indicated in the face on the left, I move the anterior teeth forward. On the other hand, if the impaction of the canines was caused by a drifting forward of the molars and premolars, as shown in the face on the right, I move the molars and premolars distally, because if the anterior teeth of this child were moved forward we would get a bimaxillary protrusion.

Fig. 2 shows a typical condition caused by a lack of development in the premaxillary region. The oral picture, Fig. 3 *A*, shows the case after five months of treatment. Please notice how the canines have been rotated and tipped into

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an upright position. Also notice the space made for the right second mandibular premolar, by the following technique: I banded the first premolar. A coil spring was placed over a shortened end tube, the end of which rested against the lock on this tooth. The twin-arch was fastened to the anterior teeth with wire ligatures. The coil spring on the end tube was compressed by flattening the tube in front of the coil. This opened the space for the second premolar.

Fig. 1.

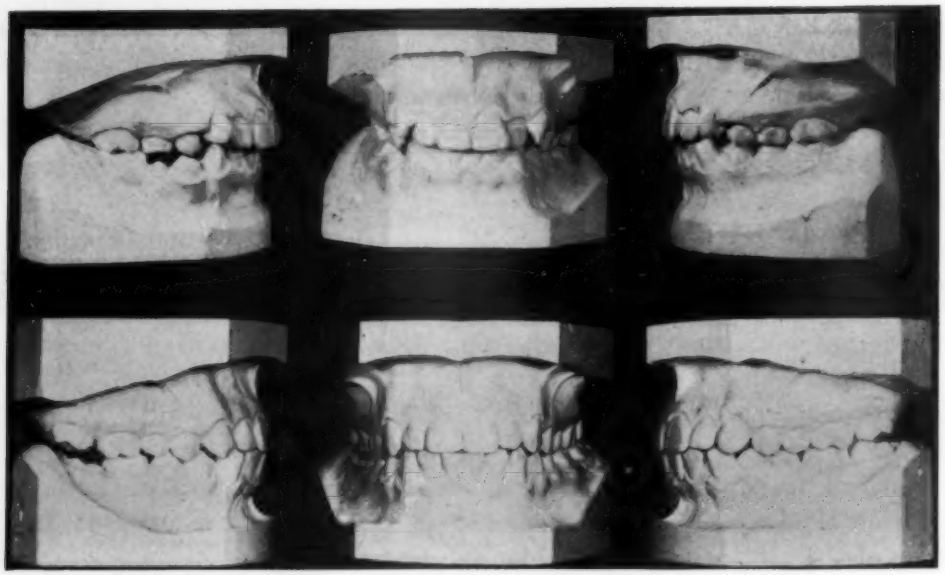


Fig. 2.

Fig. 3 *B*, shows this same case two months later. You will notice that the lower appliance has been removed and a soldered lingual appliance substituted. At the end of another two months the upper appliance was removed and a Hawley plate was given to the patient, Fig. 3 *C*.

The lower models in Fig. 2 show the case as it is today. The photographs, Fig. 4, show the appearance of the boy at the beginning of treatment and when retention was begun.

Fig. 5 shows the models of a 14-year-old boy with impacted canines due to the early loss of his maxillary deciduous molars. The twin-arch was adjusted to the maxillary arch, it being fastened to the four anterior teeth. A soldered

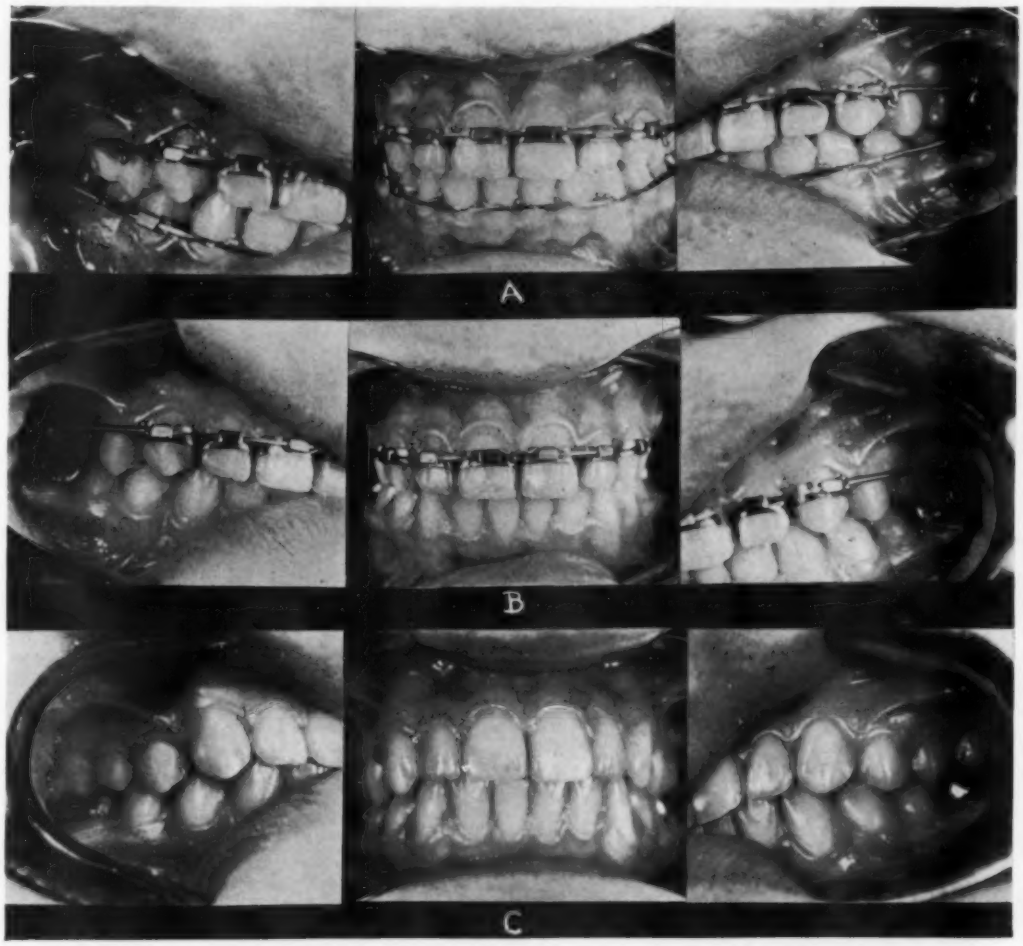


Fig. 3.

Fig. 4.

lingual appliance was placed on the mandibular arch. As soon as he had become accustomed to the twin-arch, coil springs were placed over the end tubes of the maxillary arch and pressure was exerted to move the first molars distally. Of course, intermaxillary rubbers were worn from the upper to the lower to prevent the anterior teeth from moving forward.

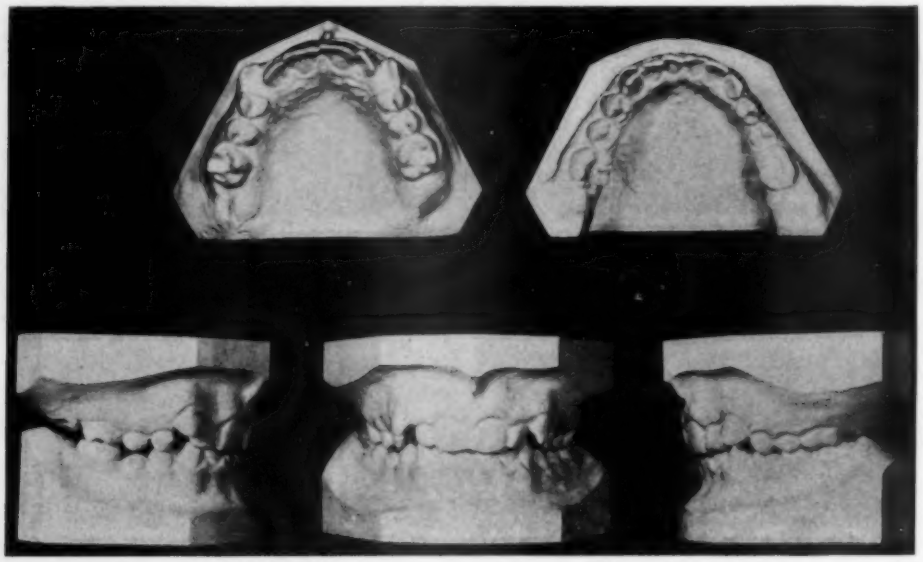


Fig. 5.

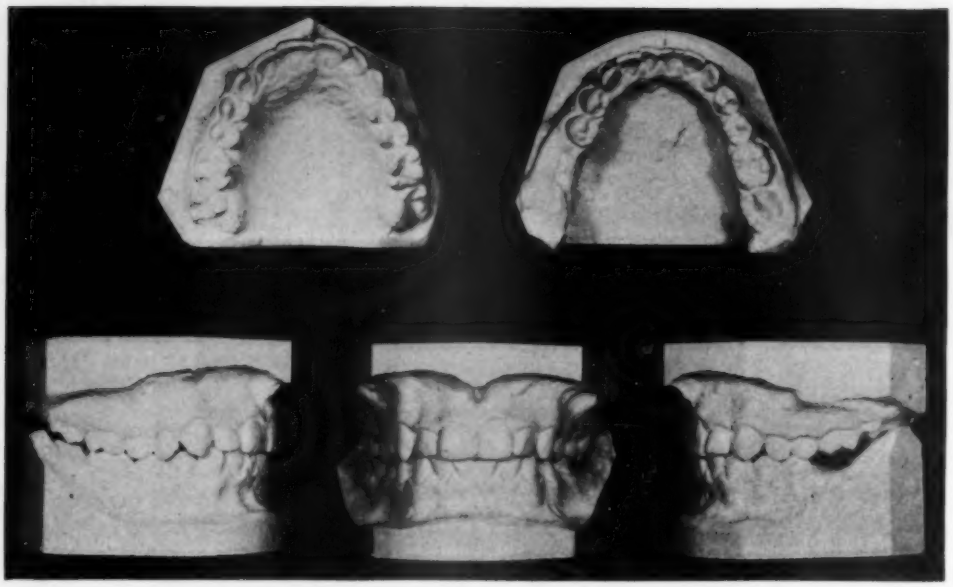


Fig. 6.

Fig. 6 shows the case eleven months later, when he was given a Hawley retainer. Since the lower mandibular arch was not expanded, all lower appliances were removed. You will notice that he has lost his left first molar. The pulp had been destroyed in this tooth before I began treatment, but I persuaded the dentist to treat it so that I could use the molar for anchorage. When

the lower appliances were removed, we had it extracted. He is now wearing a space retainer from the second premolar to the second molar.

The upper models in Fig. 7 are of a child ten years old. This case, like the preceding, has a maxillary impacted right canine due to the early loss of the deciduous teeth. Please notice the inclination of the left maxillary lateral. The four anterior teeth were banded, as well as the molars, and a twin-wire arch was adjusted. A soldered lingual appliance was used on the lower as no expansion was necessary. The second models show the case at the end of a year's treatment. Notice how much I have overworked the maxillary teeth on the right side. I did this deliberately to give the canine ample room to come down.

Fig. 7.

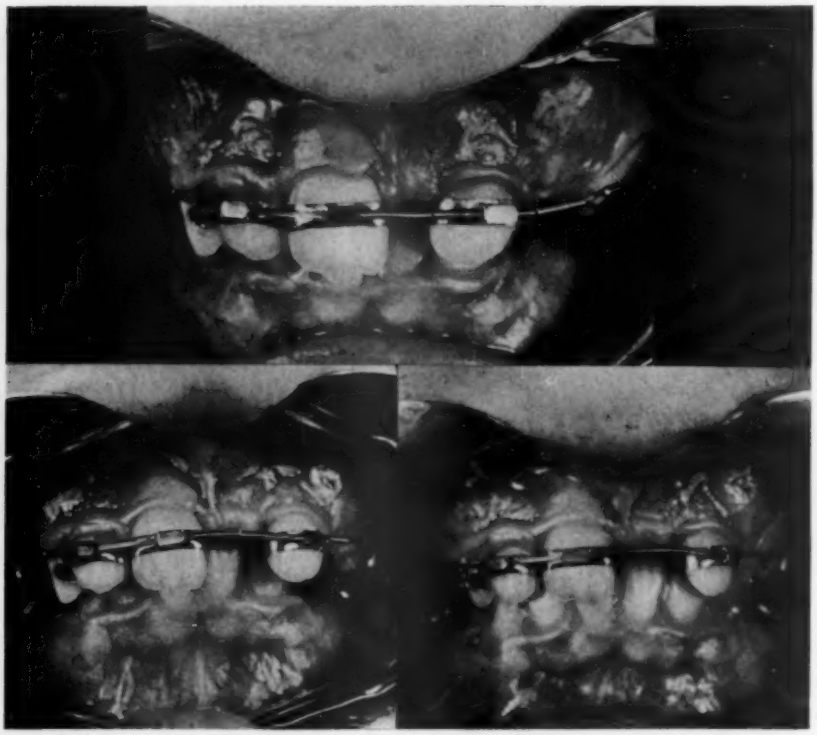
Fig. 8.

The oral pictures, Fig. 8, show the case at the time the Hawley retainer was discarded. You will notice the molars and bicuspids on the right side have drifted forward into their normal position.

The next case, Fig. 9 *A*, is a neutroclusion of a boy 9½ years old. A supernumerary tooth had caused an impaction of the left central incisor. You will notice I have a twin-wire arch on the maxillary arch with coil springs between the right central and the lateral incisors. Since these springs are compressed

when the locks are seated on the bands, it causes the teeth to move along the twin-wire and open the space as shown in the next picture, Fig. 9 *B*, which was made two and one-half months later.

A.



B. *C.*

Fig. 9.

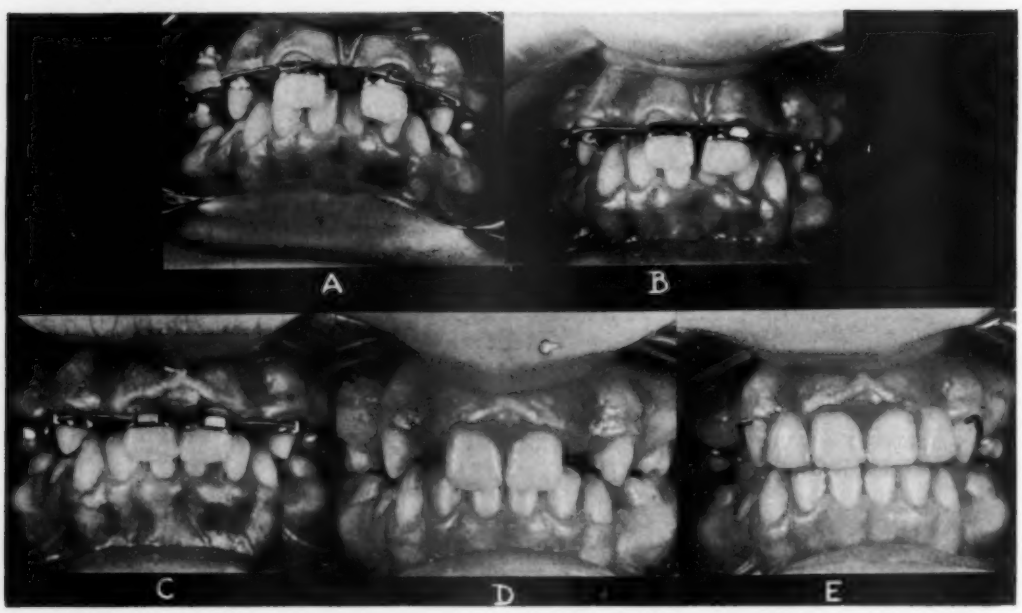


Fig. 10.

In the picture, Fig. 9 *C*, taken three months after *B*, you will notice the space has been completely opened. I also had him wear intermaxillary rubbers to bring the anterior teeth lingually.

The next case, Fig. 10 *A*, is of a girl, 11 years of age. She has two maxillary lateral incisors and the eight premolars congenitally absent. It was decided to draw the central incisors together, and not disturb the rest of the teeth. Fig. 10 *A* shows appliances on the teeth. The central incisors, canines, and first

Fig. 11.

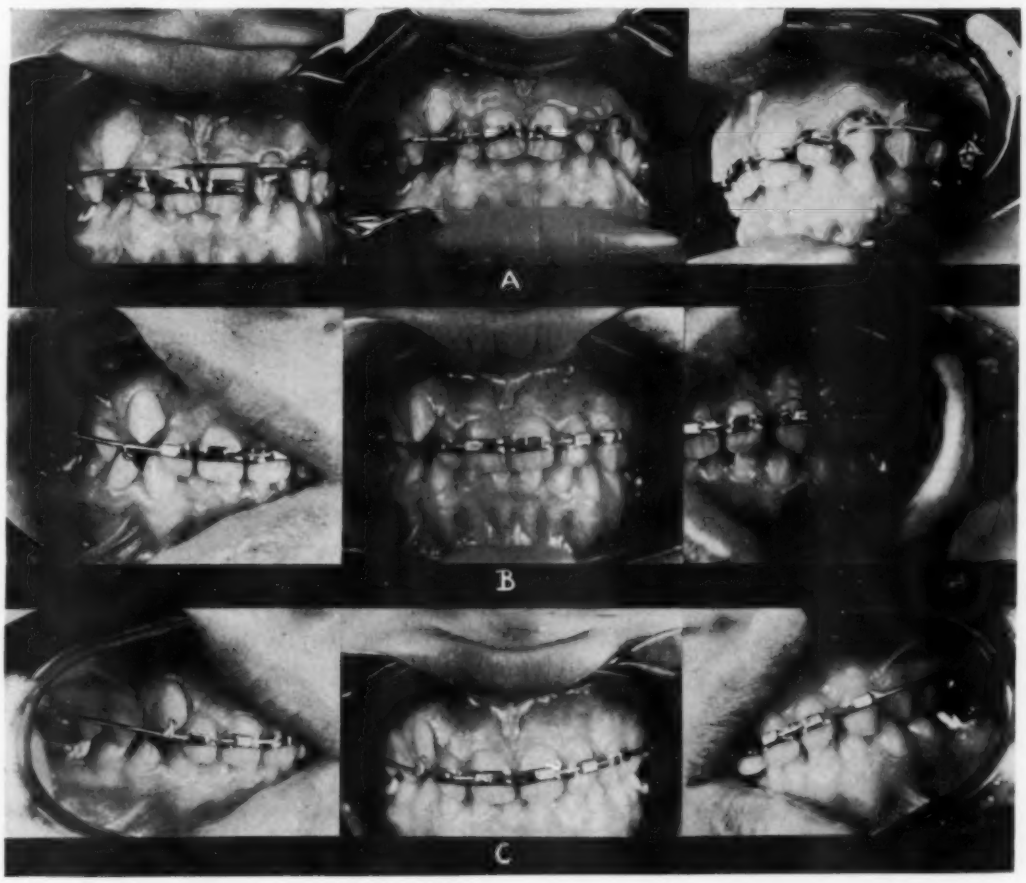


Fig. 12.

molars were banded, and a twin-wire arch was adjusted. The coil springs on the midsection of the arch rest against the canine and central locks; the end tubes rest against the distal of the locks on the canines and are made to bind in the buccal tubes on the molars by pinching the buccal tubes over the end

tubes with a Young plier. This procedure pits the molars and cuspids against the central incisors. The coil springs cause the centrals to slide bodily along the twin-wires. The main concern was not to move the central incisors too fast.

Fig. 10 *B* shows the case after six months of treatment.

Fig. 10 *C* was taken two months later. Fig. 10 *D* shows the condition at the end of a ten months' treatment, when a Hawley retainer was given the patient, as shown in *E*.

The next case, of a girl 13 years of age, Fig. 11, is a neutroclusion in which the premolars and molars shifted mesially on the left side. The left canine was so badly tipped and rotated that the twin-arch could not be seated in the lock, so a 0.009 wire ligature was doubled on itself and passed through the locks and then ligated to the twin-wire arch as shown in picture on right in Fig. 12 *A*.

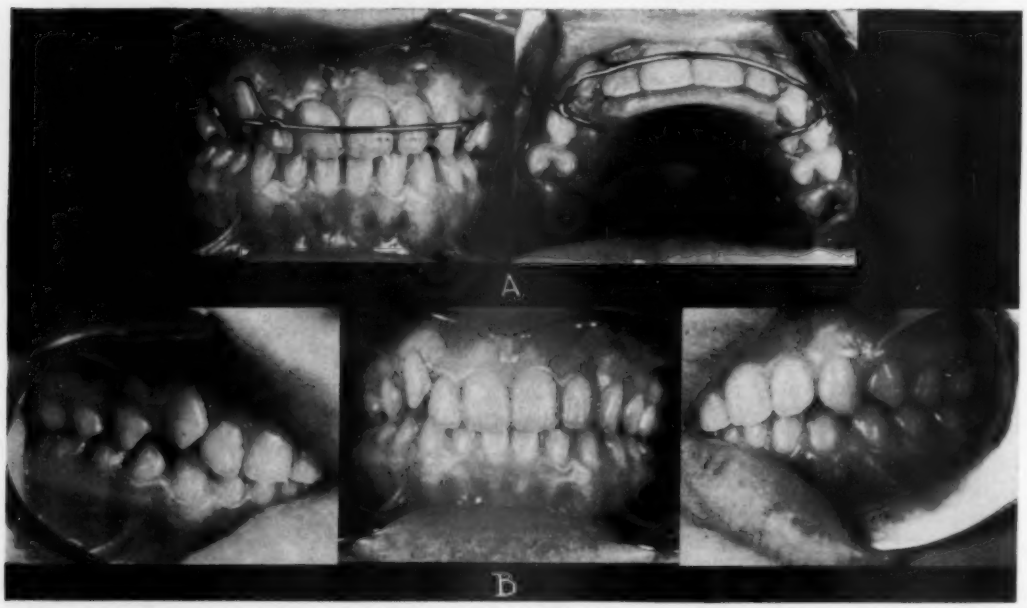


Fig. 13.

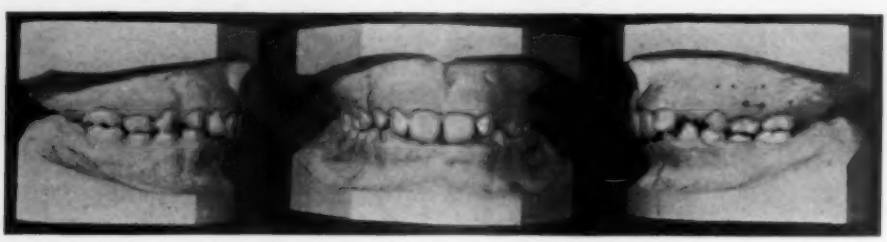


Fig. 14.

The second pictures, Fig. 12 *B*, were made three months later. Please notice how the teeth have been lined up. The next pictures, Fig. 12 *C*, were made after a lapse of another three months. The right cuspid is being moved lingually by reversing the hook on the twin-wire arch.

Two months later all appliances were removed, and the child was given a Hawley retainer, Fig. 13 *A*. Since no expansion had been made in the mandibular arch, the lower appliance was removed at this time, Fig. 13 *B*.

Fig. 14 shows models of a child, 12 years of age. It is a neutroclusion with a deep overbite. Please notice how the crowns of the central incisors diverge.

Fig. 15 *A* shows the appliances used in correcting the case. The buccal tubes are soldered so that the twin-wire arch lies to the gingival of the locks. A soldered lingual appliance was used on the lower arch. Fig. 15 *B* shows the case after eight months of treatment. Three months later all appliances were removed, and the child was given a Hawley retainer. As there was no expansion in the lower arch, no retention was necessary.

Fig. 15.

There has been so much said and written about distoclusion that it seems almost impossible to add anything new regarding it. However, after reading the various papers I have seen upon the treatment of this type of maloclusion, I believe it possible to present to you some ideas, which, though not entirely new, do differ somewhat from the usual procedure in treating this type of maloclusion.

I found, in my amalgam model predetermination, in a complete bilateral distoclusion, that if we endeaver to move the teeth in the mandibular arch forward until the first molars are in normal mesiodistal relation, we were obliged to do a tremendous amount of tooth movement, and, even if we were able to

accomplish this movement, it was extremely difficult to retain it. Furthermore, the facial results were not always as pleasing as we had hoped for.

I believe the late Dr. Calvin Case of Chicago was the first man to recognize that in distoclusion the mandible was not entirely at fault, but that the maxilla may be forward also. He advocated extracting the first premolar in such cases. When Dr. Simon brought out his method of relating the model to points on the head, he found the maxilla was often forward. Dr. Milo Helman also made the same discovery in his cranial measurements. A great many other men have reached the same conclusion. And now I think it is generally recognized by most orthodontists that this condition exists.

I am a strong believer in this theory and treat my cases accordingly. In some of the simpler types I may not move the maxillary molars distally, but do so in the great majority of instances. I am against the overexpansion idea as the appearance of many children is ruined by overexpansion. I do as little expansion as possible to get the teeth into alignment. Additional space is gained by moving the maxillary molars distally.

Fig. 16.

Fig. 16 shows the before and after models of a girl 16 years of age. She has a unilateral distoclusion with a labio version of the maxillary anterior teeth. The first maxillary molar on the left side is in linguoclusion. The lower models show the case when retention was begun.

Fig. 17 *A* shows the simplest appliance I used in the treatment of such a distoclusion. You will notice I have banded the four maxillary incisor teeth with $\frac{3}{32}$-inch width bands. The canines are not banded unless it is necessary to rotate or tip them. The buccal tubes have been soldered to the molar bands so the twin-arch lies in a straight line, as is shown in *A*. This is important because it prevents the binding of the arch in the buccal tubes when intermaxillary rubbers are worn, and consequently allows no tipping of the maxillary molars. We also have better control of the movement of the maxillary anterior teeth.

I usually start the cases with a 0.010 twin-wire for the midsection, especially if the anterior teeth are irregular or if there are spaces between the teeth to close. When this is accomplished, I change to 0.011-inch twin-wire, because the latter is stronger, and there is less danger of tipping the maxillary molars. If the afore-mentioned condition does not exist, I start the case with the 0.011-inch wire. Some of the easier cases are corrected without the twin-wire arch ever being removed.

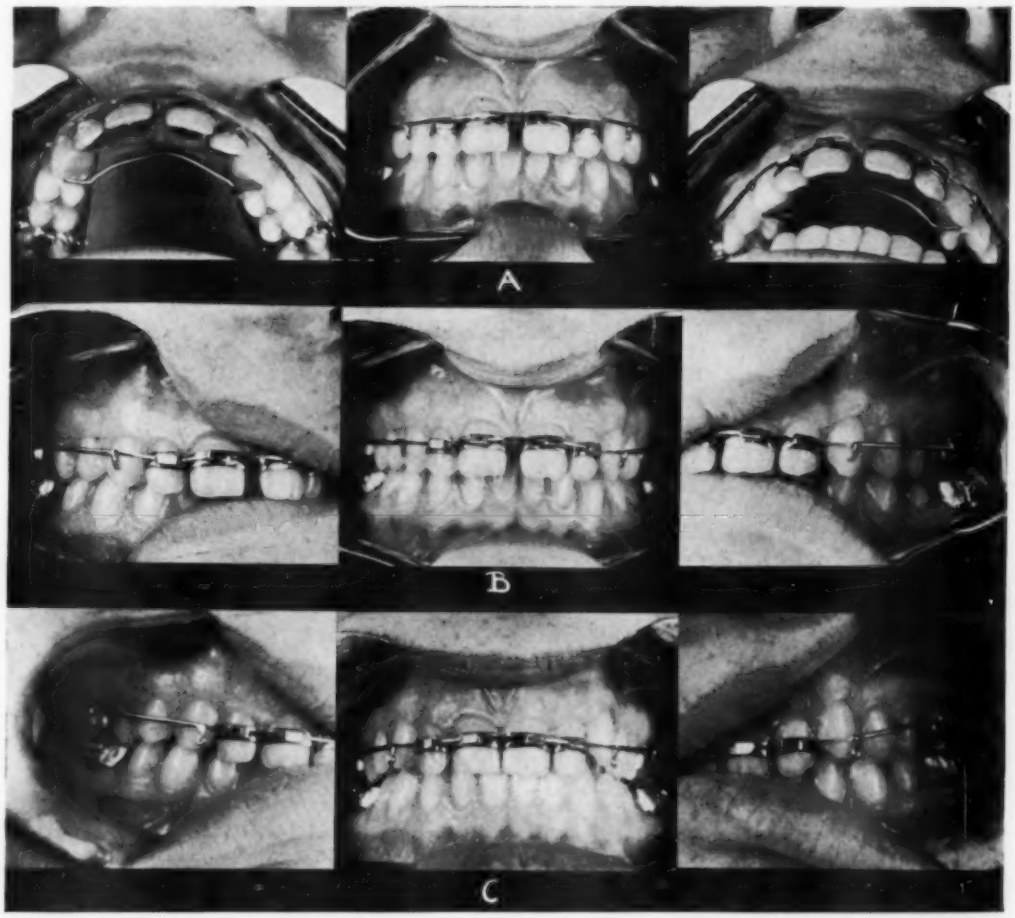


Fig. 17.

I have a soldered lingual bar on the mandibular arch. I do not place a lingual appliance on the maxillary arch unless expansion is necessary. However, this case has one. Fig. 17 *B* shows right and left sides; the intermaxillary hook is placed in the middle of the canine. The case is started with rubber bands which have a three-ounce pull on each side. The amount of pull of the rubbers is controlled by the position of the hook: that is, if a light force is desired, the hook is placed back, and if a stronger pull is desired, the hook is moved forward. The location of the hook is regulated by the length of the midsection of the twin-arch.

When the maxillary anterior teeth have been brought in contact with the mandibular, Fig. 17 *C*, I place ½ or ⅜-inch coil springs over the end tubes as

shown in Fig. 18 *A*. I compress these springs to exert a pressure of three ounces on the molars. The pressure of the intermaxillary rubber is increased to four ounces. When the maxillary molars have been moved distally, until the mesial buccal cusp is about $\frac{1}{32}$ of an inch back of the buccal groove of the mandibular molar, I remove the coil springs, pinch a stop in the twin-wire arch with a Young plier, and let the child wear rubbers at night (Fig. 18 *B*). If, after about two months, the teeth have remained in a normal relation, I replace the twin-arch by one that does not have hooks. I dent the buccal tube with the Young plier so that the end tube of the twin-arch binds in it. This is very easily done with a tube, but is practically impossible with a solid bar. The patient is allowed to wear this passive retention for about two months. If the occlusion has remained normal, all of the upper appliance is removed, and the patient is given a Hawley plate with an incline plane built into it.

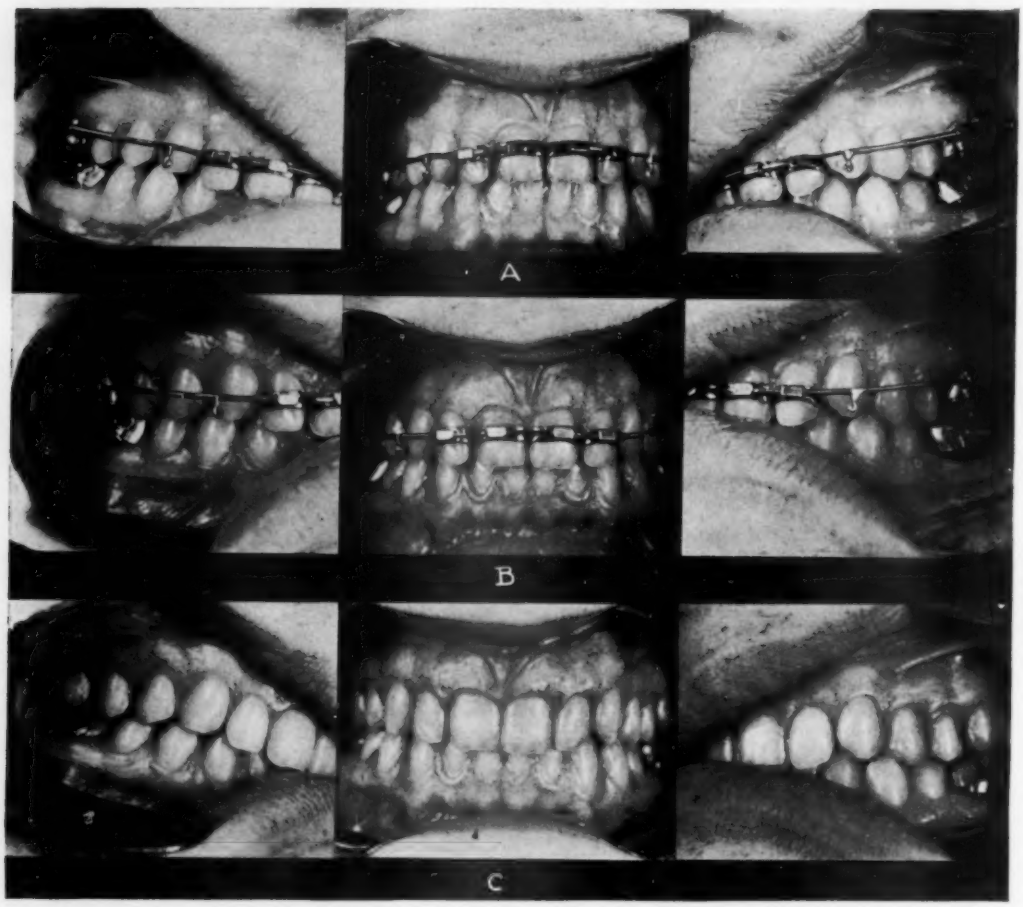


Fig. 18.

Figs. 19 and 20 are photographs of the patient before and after this treatment.

I shall now show some cases worked by this simple method. Fig. 21 is the model of a child 10½ years of age. She has a bilateral distoclusion with excessive labioversion of the maxillary central incisors, with the maxillary laterals lying far back in the palate behind the central incisors.

Fig. 19.

Fig. 20.

Fig. 21.

Fig. 22.

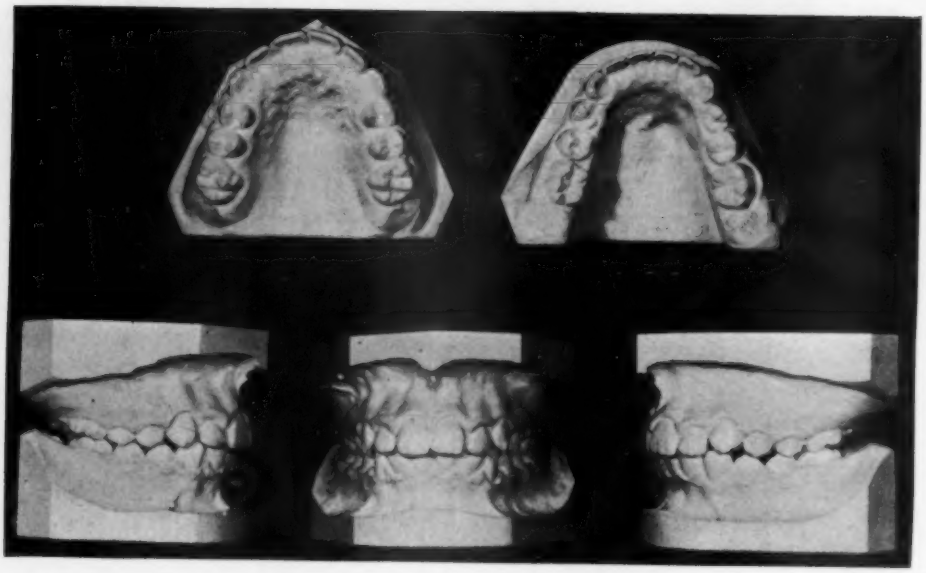


Fig. 23.

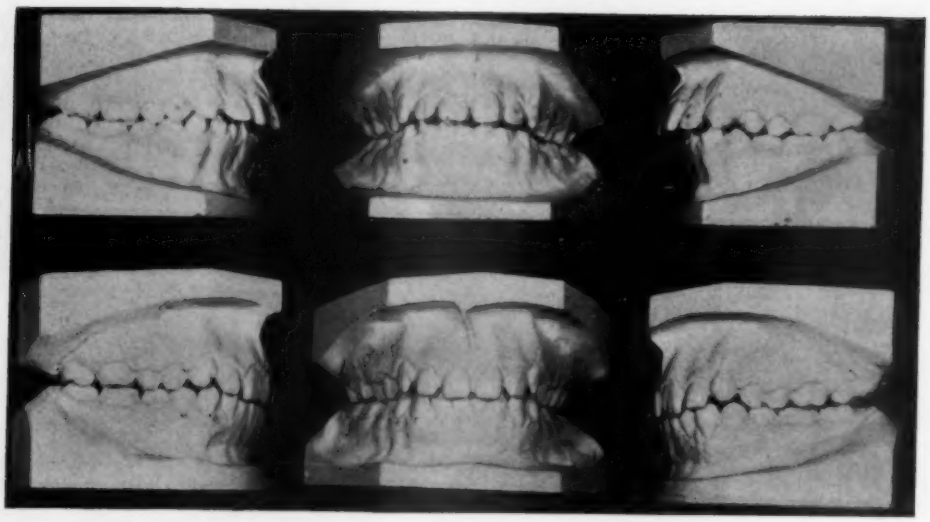


Fig. 24.

Fig. 22 shows the twin-wire arch on the child seven months after treatment had begun.

Fig. 23 shows models of the child when all appliances had been removed. She is wearing a soldered lingual appliance on the mandibular and a Hawley plate on the maxillary arches. Please notice how nicely the lateral incisors have been brought forward bodily into occlusion.

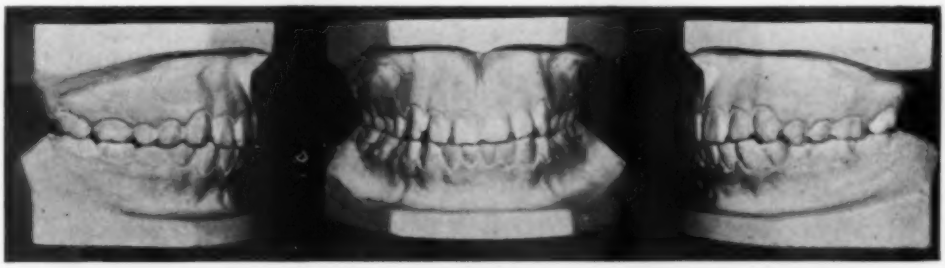


Fig. 25.

Fig. 26.

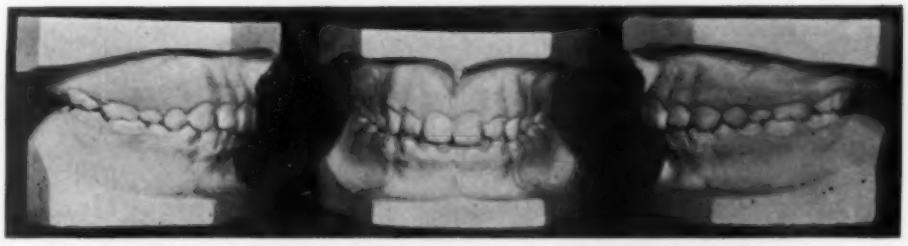


Fig. 27.

Fig. 24 is a unilateral distoclusion of a girl, 13 years old. The left side is normal mesiodistally. I am showing this case to impress upon you how the twin-arch corrects splayed or fanlike formation of the anterior teeth. Please note also the inclination of the crowns of the maxillary incisors, including the canines. I banded the four maxillary incisors when I began, but at the end

of six months, when I recemented the appliances, I also placed bands on the canines. At the time I worked this case I was still cementing all appliances every six months. It seemed that in moving the four incisors back I crowded the cuspids so much that they were depressed. Note also the lower models taken at the time. The maxillary molars were moved distally to relieve this

Fig. 28.

Fig. 29.

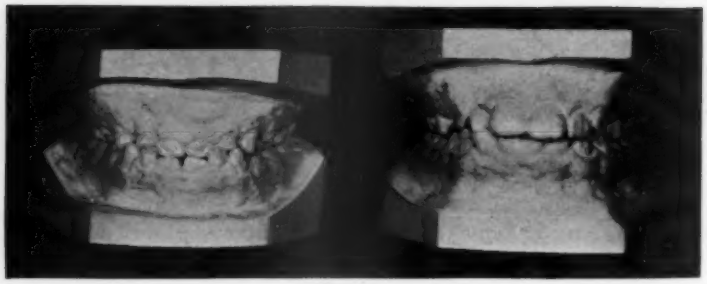


Fig. 30.

condition by the method already described. I also wanted to tip the roots of these cuspids forward. This patient wore the twin-arch for eleven months, when a Hawley plate was placed on the upper arch and the lower appliance was removed.

Fig. 25 shows the case one year after all retention was removed. Observe the good inclination of all six maxillary incisors.

Fig. 26 shows an extreme case of bilateral distoclusion. If there ever was a case in which the prognosis looked unfavorable, this was it. This child was 10 years old. She weighed forty pounds, was delicate, and had been sick all her life. I deliberately overworked this child, as shown in the lower models, Fig. 26. The result here shown was obtained in about eight months. I held her teeth in this position for about four months, then removed all appliances, and kept her under observation until the teeth drifted to a normal position, which took another four months. Then the Hawley appliance was placed on the upper arch and worn at night.

Fig. 31.

Fig. 32.

Fig. 27 shows this case a year after all appliances were removed. I am sorry I failed to take photographs when I started this case. Fig. 28 is a snapshot made about the time I began treatment. Fig. 29 shows her as she looked at the end of the treatment.

Fortunately I am seldom called upon to treat mesioclusion cases. Recently, in my home city, I sat at a table for lunch where I could see and count the people who passed on the sidewalk. About three thousand passed in an hour, and watching carefully I saw only one who had a recognized mesioclusion. This would indicate that my section of the country does not have many cases of this type.

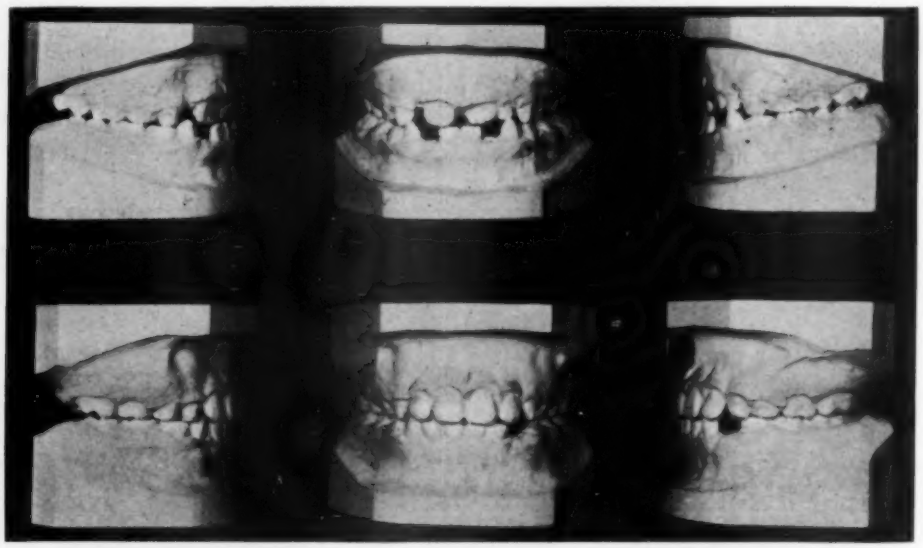


Fig. 33.

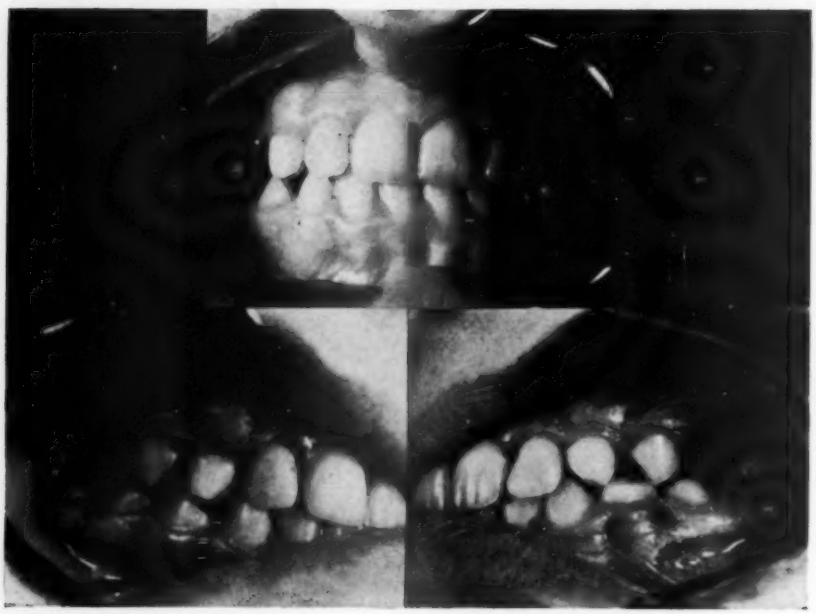


Fig. 34.

Mesioclusion is not particularly hard to correct. In fact I find it as easy or easier to treat than the distoclusion. But our grief comes when we try to retain it. In these cases I am careful to observe any symptoms or signs of endocrine disturbances. If there are any I do not advise treatment.

Mesioclusion is one type on which I begin treatment early. In the extremely young, say 3 or 4 years of age, I teach the mother to try to prize the mandible back and the anterior teeth forward with a springy-tongue depressor. If she is persistent, it is surprising what good results she can obtain.

Fig. 30 shows the models of a girl, 5½ years old, worked by this method. The model on the right shows the case four years after treatment was begun. She was unable to bite the right lateral over, so the twin-wire mechanism was placed on the maxillary arch, and the tooth was brought into position in three months, Fig. 31 *A*.

Fig. 31 *B*, *C*, and *D* are oral pictures of this case one year later.

When I find it necessary to put on appliances, I band the six anterior teeth in both arches and place a twin-wire arch on both the mandible and the maxilla. I use four-ounce rubber bands from the lower to the upper, Fig. 32. The hook is placed on the mandible twin-wire arch just distal to the canine. In treating these cases I not only try to get normal mesiodistal relation of the arches, but also endeavor to develop a deep overbite. This deep overbite helps retain the normal relation.

Fig. 33 shows the models of a girl, 6 years old. The lower models show results one and one-half years after active treatment was started. The lower appliance was removed at the time retention was begun. The child is wearing a Hawley plate in the upper arch without the labial bar, but with a finger extending between the lateral incisors and canines to prevent the central incisors from separating.

Oral pictures shown in Fig. 34 were taken three years after the lower models in Fig. 33. Please notice how the overbite is getting deeper. This is a good sign that the teeth will remain in normal occlusion.

752 Starks Building

EXAMPLES FROM PRACTICE SHOWING THE NECESSITY FOR DIFFERENTIAL DIAGNOSIS AND THE APPLICATION OF RATIONAL TREATMENT PRINCIPLES

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IN CLINICAL orthodontics we know that treatment must be based upon the findings of an accurate diagnosis. This must include an appraisal of the anomaly which has determined its nature, extent, and all the structures involved. Treatment measures may then be directed toward altering those conditions and relations which have deviated from what we term "the normal." This represents a variable range, conditioned by race, type, heredity, and certain other physiologic factors. Anatomically speaking, however, it must meet certain requirements, for we who attempt the correction of dentofacial anomalies must have an end in view, i.e., the condition which it is desirable to establish, and this should be previously conceived. In each case, therefore, we must consider tooth positions, dental arch form, maxillary relationships, the status of the facial and oral muscles, and other factors. There is no escaping these considerations if the objectives of treatment are to be definite and successful.

Many orthodontic clinicians have made claims for treatment programs without offering any reliable source of proof. Methods of proof have long been available and are now commencing to be appreciated. None are perfect, but all are helpful. Case, long ago, blazed the trail with his facial casts; Simon added photostatics and gnathostatics; Broadbent and Todd gave us the roentgenographic cephalometer; and Hellman developed the facial mask. The three latter methods are applicable to office routine, and the results of treatment recorded by such methods have, at various times, been made available to our specialty. Such procedures are necessary if the efficacy of a treatment program is to be determined. In spite of their imperfections and limitations, their helpfulness is justified a thousand-fold, when compared to the old-fashioned, unrelated denture casts which all too frequently are utilized to record clinical accomplishments.

The recognition of orthodontic limitations is always a subject for serious consideration, and especially in the treatment of dysgnathic anomalies where, in addition to establishing dental function, supplemental growth changes in the maxillary and facial structures must also be included in the objectives of treatment. If malformed, malrelated, and distorted anatomic relationships are to be restored to normal form and function, the foundation for new growth patterns must be established. Here the first limiting barrier is heredity. In the germ cells are present every developmental possibility that can be realized

Read before the Twentieth Annual Meeting of the Southwestern Society of Orthodontists, Feb. 4, 1941, at Lubbock, Texas, and also before the Nineteenth General Meeting of the Pacific Coast Society of Orthodontists, Feb. 21, 1941, at San Francisco, under the title, "Five Cases Treated With the Open Tube Appliance, With Data Necessary to Prove the Efficacy of a Treatment Program."

in the adult. These may not be exceeded, and, unless the potential for such patterns is present, we cannot produce them. This statement, however, is not the justification for a defeatist attitude, for Todd, one of the most celebrated anatomists of our time, and with a deep interest in our problem, states, "The physical pattern of the individual is enhanced, warped, dwarfed, or mutilated in its expression by the effects of environment."

With full recognition of the ever present influence of heredity in all organic life, modern science now seems reconciled to the conclusion that heredity determines how far an organism can develop, while environment determines whether it will ever get there. This is of great importance to orthodontics, for, even though we cannot change a patient's hereditary possibilities, we can so alter the environmental factors that those controlled by heredity can do indispensable work for us. Such a program must include the elimination of pathologic or other inhibiting influences to growth; the preparation for growth responses by establishing the best possible metabolic balance, thereby making our patients favorable orthodontic risks; and the establishment of normal dental function through orthodontic means, supplementing it with the growth stimuli which may be induced by establishing normal functional habits in the entire facial ensemble. With these things accomplished, the objectives of treatment may be definitely assured.

The end results of different treatment programs may vary greatly, depending not only upon methods and policies employed, but upon the other factors to which reference has already been made. The assumption that any one of several methods will lead to the same end result is not justified, nor has it ever been verified. The policy adopted, especially in dysgnathic anomalies, is a matter of tremendous importance, for here every agency or principle which will favor adaptive and supplemental growth changes, assumes major importance. An unwise policy may greatly reduce the amount of helpful growth which should be the accompaniment of treatment.

In presenting a series of five cases for study, the important evidence upon which diagnosis was based in each instance will be shown, the plan of treatment used will be outlined, and the results achieved demonstrated. This will be done so that the progressive changes in the way of growth which followed the establishment of the teeth, dental arches, and jaws, in a status which approximated the normal, may be visualized. In an effort at brevity, only the most essential items will be included. Roentgenograms will not be shown, although, of course, each case presented was adequately surveyed by such means. In addition to the photostatic facial records and gnathostatic denture reproductions used for diagnostic purposes, additional recordings made at subsequent intervals will be included in an effort to render the study more comprehensive. These have all been prepared in a similar manner, with facial and denture photographs in the same ratio of size, thereby rendering dependent relationships less confusing than where differing proportionate sizes are used. In the appraisal of each case, first the denture will be considered and then the face, although the interdependence of the two factors merges in so many instances that it is difficult to separate them, even where only the denture is affected. A general outline will be followed which has been found to be helpful in present-

Fig. 1.—The series of five cases presented for study. It will be noted that three are dysgnathic anomalies, and two are eugnathic anomalies.

ing a study of groups of cases. This must, of necessity, be brief, including only the most essential items. These are (1) history and attributed etiology, (2) diagnosis, (3) treatment therapy employed, and (4) results achieved.

In the five cases which claim our attention (Fig. 1) it will be noted that three are *dysgnathic*, and two are *eugnathic* anomalies. These patients were from 8 to 20 years old; and therefore they show the general type of anomalies which constitute the bulk of the usual orthodontic practice. If a study is made of their dentures, it will be noted they have one characteristic in common, viz., all of the lower teeth apparently occupy a posterior malrelationship to the opposing upper teeth. They would, therefore, according to certain standards, all be designated as "Class 2" cases, "posterior occlusions," "distoclusions," or by other terms frequently employed to designate an anomaly of supposed

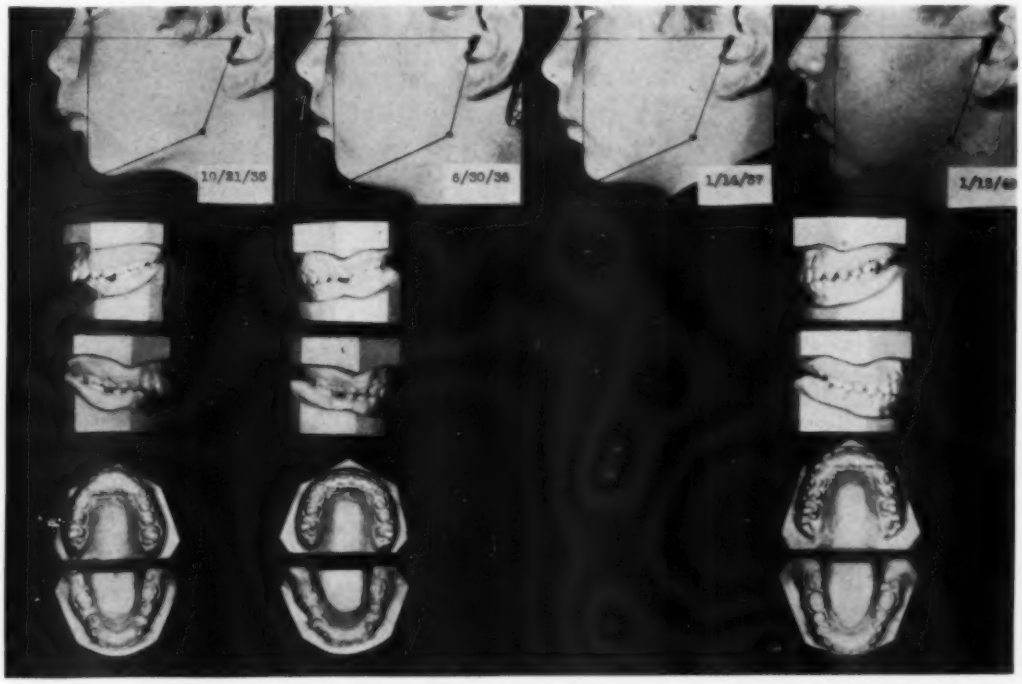

Fig. 2.—Case 1. A series of facial and denture records of a boy, aged 10 years, at the time treatment was started. In studying the first records, it will be obvious that this is a dysgnathic anomaly of the severe type.

distinct type. A study of the facial records, however, reveals how erroneous and misleading it might be to appraise an anomaly by *a denture record alone*. To judge it in this fashion and follow a so-called standardized mechanical treatment program could be truly disastrous. These five cases, therefore, should render emphatic the necessity for differential diagnosis before a treatment policy is adopted.

Case 1.—*(Fig. 2) (B. B.)—History and Attributed Etiology.*—The patient was a boy 10 years of age, American born, of Russian Jewish parents. He was not in robust health, although he was capable of attending school and carrying out the usual activities in keeping with his age. He has been subjected to the usual childhood diseases; his tonsils had been removed several years previous to becoming an orthodontic patient. He showed no indication of nasopharyngeal

pathology, but he was a habitual mouth breather. Both parents and three maternal uncles were available for observation, and all had normal dentures. They were inclined to have prominent premaxillary regions, but since this was bimaxillary, it was judged to indicate a type rather than a deformity. In the

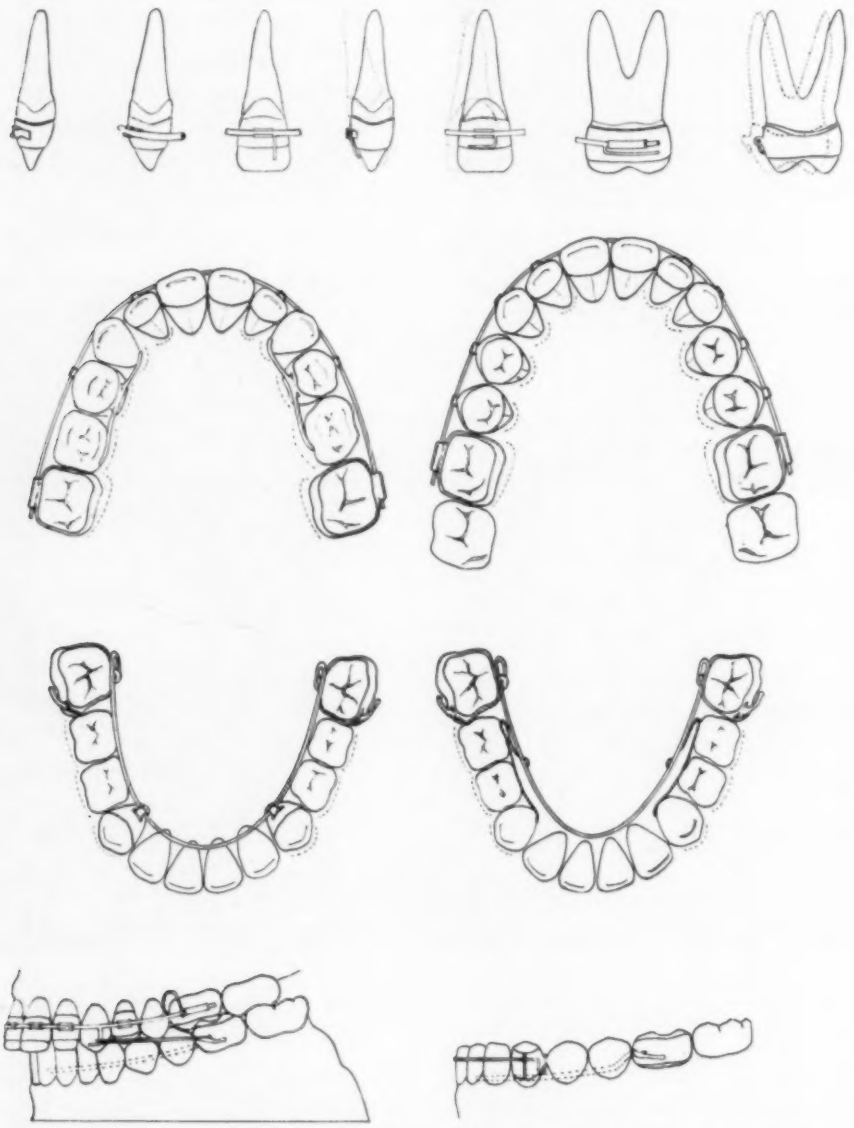

Fig. 3.—The simple mechanical principles employed in the treatment of all the cases reported. Upon the maxillary teeth, attachment bands carried "open tube attachments" to engage a round labial arch wire, the frontal portion of which was 0.030 inch in diameter. The end sections were 0.038 inch in diameter and were supported by round buccal tubings on the molar bands. Upon the lower teeth, the removable lingual arch wire was used.

patient the incidence of caries was mild; the soft tissues of the mouth were healthy; the tongue and lips were normal in size, but the latter were malrelated, except under muscular effort. From the foregoing facts, it was felt that the sub-par metabolic state of the patient during infancy, plus the stresses of malfunctioning facial muscles, due to mouth breathing, had been important etiological factors in the development of this dysgnathic anomaly.

Diagnosis.—A study of the denture and facial records revealed the fact that the upper and lower dental arches were narrow to a mild degree, the upper incisors were in marked protraction, and the centrals were in supraversion, with all of the lower teeth, including the mandible, occupying a posterior malrelationship. The facial muscles were deficient in tone, and the lips were malrelated.

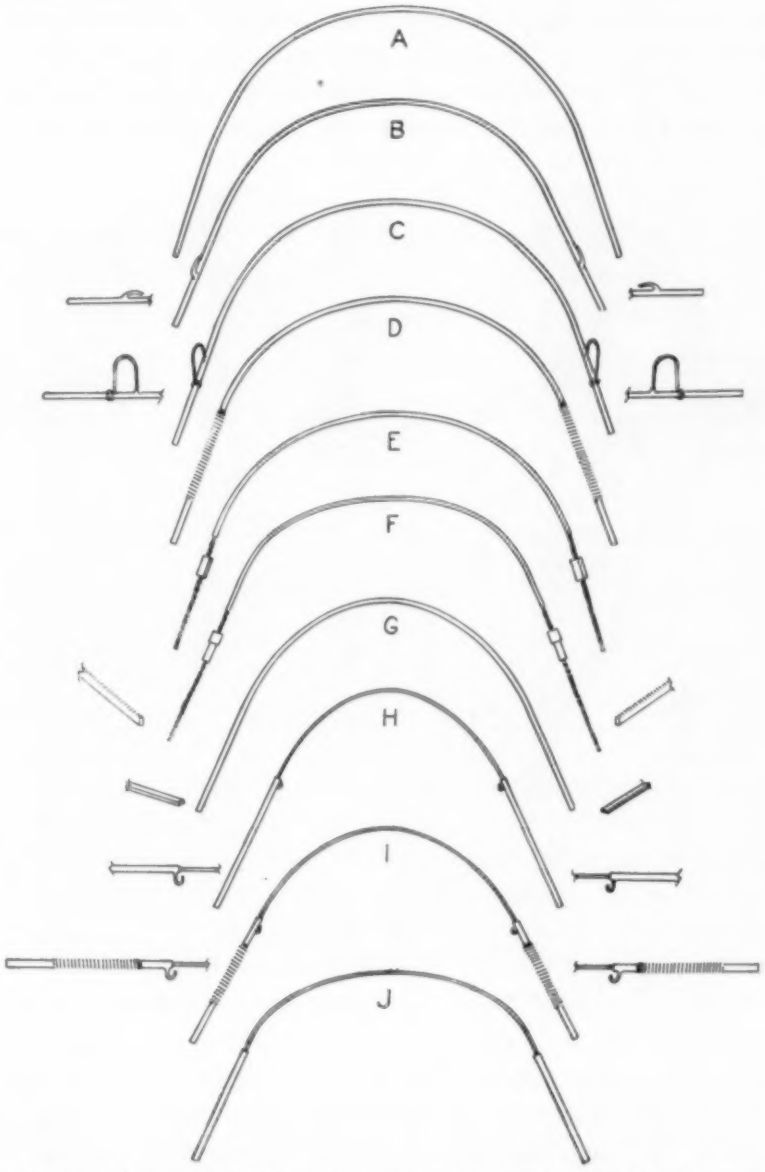

Fig. 4.—Different forms of labial arch wires. The one shown under *J* has a frontal section of small wire and end sections of larger wire; it is employed by the author and referred to in the legend of Fig. 3.

Treatment Therapy Employed.—A labial arch wire was placed upon the upper teeth, being anchored to the first permanent molars, and for purposes of control, engaged attachment bands upon the four upper incisors. Upon the lower teeth a removable lingual arch wire was placed, this being anchored to the first permanent molars and stabilized in position by a band upon one of the

incisors with an attachment which held the arch wire firmly against the teeth at their gingival margins. The various mechanical principles involved are shown in Figs. 3 and 4.* The labial arch wire was first adjusted so that the upper central incisors were moved gingivally until they were harmonious in their vertical relations with the lateral incisors. Intermaxillary elastics were then applied, and the arch wire was allowed to slide in a posterior direction through the buccal tubings on the molar bands, until the spaces between the incisors had been closed; i.e., by moving all of these teeth in a posterior direction. When this point was reached, the labial arch wire was again altered by soldering "stops" in front of the buccal tubings and by giving it an upward spring so that the four incisors would be carried in this direction.

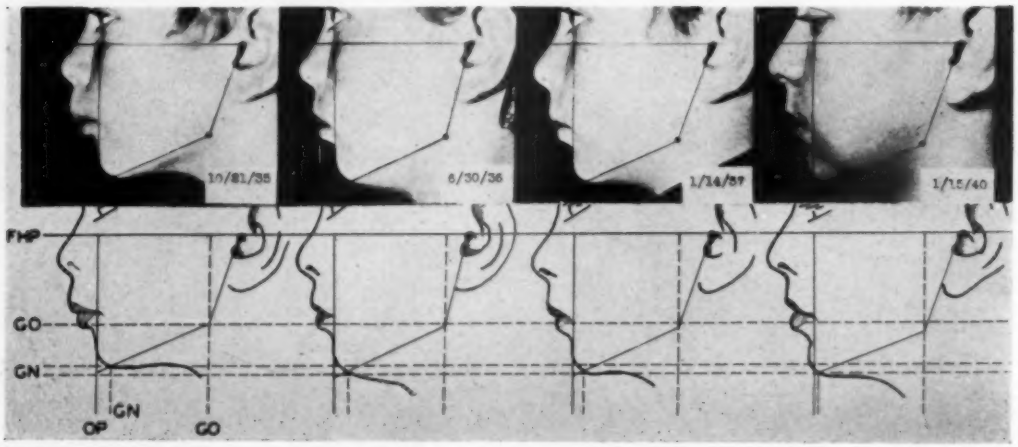

Fig. 5.—An analysis of facial growth changes has been obtained by carefully tracing the series of photostatic facial records. The measuring points indicated are the Frankfort Horizontal Plane (*FHP*), the gonion (*GO*), the gnathion (*GN*), and the orbital plane (*OP*).

Results Achieved.—By this time the upper dental arch had assumed an approximately normal form, and the upper first molars had been slightly rotated so that the lower dental arch and the mandible could be moved forward and placed in an approximately normal relationship. These improved conditions are shown in the second series of Fig. 2. To make this the comfortable position for the patient, strong intermaxillary pressure was applied and supplemented with myofunctional therapy, this latter being directed toward the pterygoid and temporal-masseter groups. So faithfully did the patient cooperate in this respect that in less than a year's time the teeth, dental arches, and jaws were in function. Within another six months active treatment measures were relaxed so far as the teeth were concerned, except to sustain them in place pending the eruption of those permanent teeth which were replacing the deciduous teeth. Myofunctional therapy was continued, however, and an exercise for general facial development was added, as additional growth in the mandible and other facial structures was considered necessary if the objectives of treatment were to be attained. An analysis of the facial growth changes accompanying treatment is shown in Fig. 5.

*Figs. 4, 6, 7, 8, 9, 12, and 13 are taken from McCoy, J. D.: Applied Orthodontics, ed. 5, Philadelphia, 1941, Lea & Febiger, and are used with the publisher's permission.

CASE 2.—*(Fig. 6) (B. K.)—History and Attributed Etiology.*—The patient was a girl, aged 8 years, in normal health and well developed for her age. Her history revealed only the usual acute illnesses of childhood. The mother's mouth and teeth were normal, and the report of the father's oral record was satisfactory. The patient's teeth were sound, there being no caries; the soft tissues were healthy; and the tongue and lips were normal in size. A roentgenographic examination revealed the normal number of teeth present in the jaws. The child had the habit of biting the central portion of the lower lip, which accounted for the protraction of the upper central incisors, but there was nothing in her history which would account for the other anomalies present.

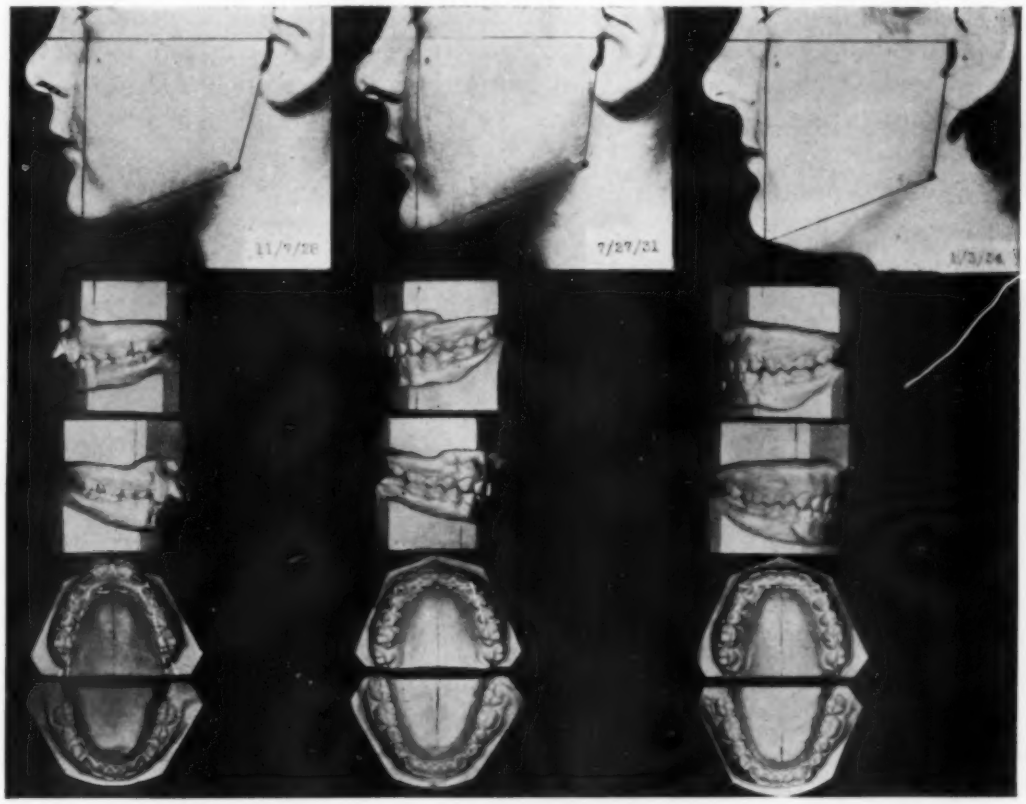

Fig. 6.—Case 2. A series of facial and denture records of a girl, aged 8 years, at the time treatment was started. This eugnathic anomaly is frequently encountered.

Diagnosis.—A study of the denture reproductions and facial records revealed the fact that both the upper and lower dental arches were narrow to a mild degree, that the upper central incisors were in protraction, with all of the lower teeth occupying a posterior malrelationship to the upper. Extra-oral observation and study of the facial record showed the mandible to be well developed; hence, in this instance, the anomaly was apparently limited to the denture. The tonicity of the facial muscles was normal.

Treatment Therapy Employed.—A labial arch wire was used upon the upper teeth, being stabilized in position by attachment bands upon the four upper incisors. Upon the lower teeth a removable lingual arch wire was placed.

The upper and lower dental arches were widened slightly, and the upper central incisors were moved posteriorly, and the upper first permanent molars rotated. This carried them in a posterior direction, so that with the aid of intermaxillary elastics, worn through a period of several weeks, opposing first molars were placed in function. As soon as the teeth could be placed in an occlusal relationship which approximated the normal, muscular exercises were prescribed, attention being directed toward utilizing the temporal and masseter groups, thereby encouraging jaw closure with the teeth in their new relationship.

Results Achieved.—So faithfully were these instructions carried out that in less than two years' time all fixed appliances had been removed. A Hawley appliance was then worn upon the upper teeth at night only, for a period of a year as a safeguard against retrogressive changes. Following primary treatment, two additional denture and facial records were made to demonstrate the status of the case. These are shown in sequence in Fig. 6, and in Fig. 7 the facial growth record is analyzed. It will be noted that the mandibular pattern has not changed.

CASE 3.—*(Fig. 8) (A. A.)—History and Attributed Etiology.*—The patient, a boy, aged 8 years, was highly neurotic and upon his first visit to the office could not be induced to submit to intra-oral examination. His history revealed a series of illnesses, including most of the diseases of childhood, infected

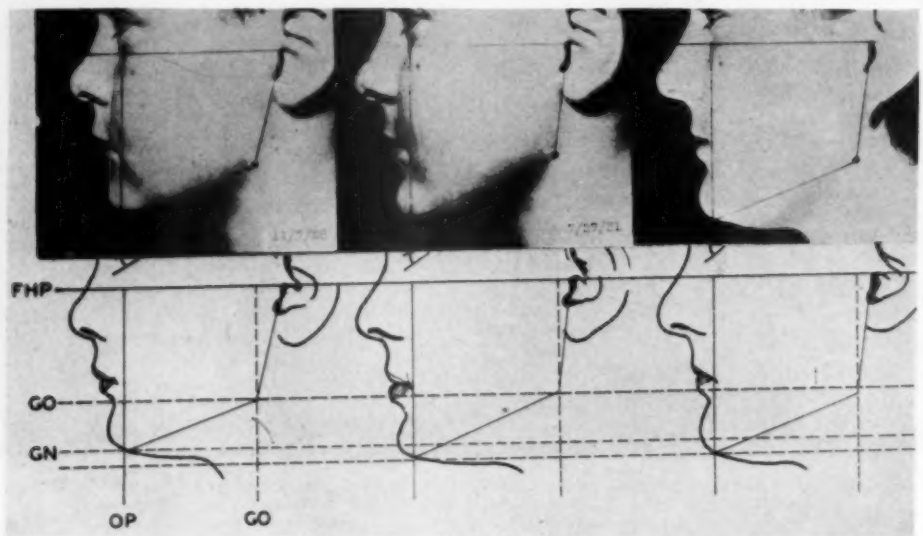

Fig. 7.—An analysis of facial growth changes. It will be noted that the mandibular pattern has not been altered. Some vertical growth has occurred.

tonsils, which had been removed, and periods of malnutrition. Information gained from the mother indicated the child's mouth, from early babyhood, had presented an appearance similar to that shown at the time of consultation, which would indicate that the deformity may have had a congenital background. In spite of a marked malrelationship, with all of the lower teeth and their adjacent mandibular structures being posterior to normal, he was a nasal breather. The teeth were free from caries, and the soft tissues of the mouth were in a normal state.

Diagnosis.—A study of the denture reproductions and facial records showed a mildly narrow upper dental arch, crowded and retruding upper incisors, which were also in marked supraversion. All of the lower teeth, plus the mandibular structures, occupied a posterior malrelationship. The facial muscles were deficient in tone, and the lips were malrelated.

Treatment Therapy Employed.—Appliances similar to those already described in connection with the previous cases were utilized. The upper incisors were first moved forward and into proper alignment and were then carried upward toward the Frankfort horizontal plane. This was achieved by making a sharp upward bend in the arch wire on each side just anterior to the buccal tubes. Before being seated in the attachments on the incisor teeth, it would, therefore, occupy a higher position gingivally than the attachments. When this stage of treatment had been reached, intermaxillary elastics were applied. The constant application of this pressure soon brought the opposing dental arches into their normal sagittal relations, after which the intermaxillary elastics were worn at night only.

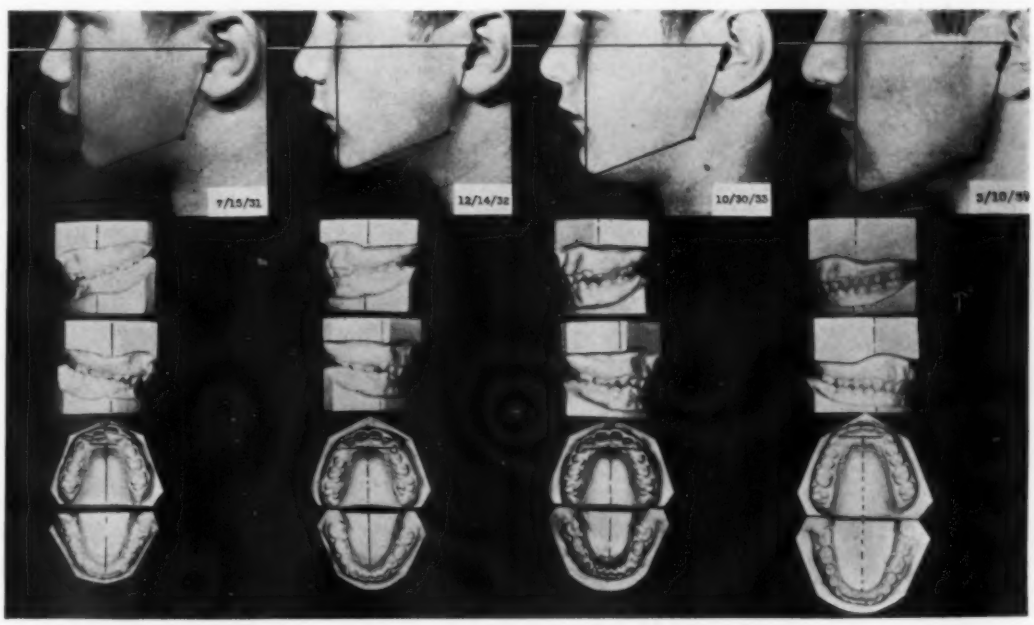

Fig. 8.—Case 3. A series of facial and denture records of a boy, aged 8 years, at the time treatment was started. In this dysgnathic anomaly, the body of the mandible showed marked arrestment of development.

Results Achieved.—At the time the case was recorded for the second time, as shown in the second series of Fig. 8, marked growth changes had occurred in the body of the mandible. All fixed appliances were then removed from the upper teeth, and a Hawley appliance, provided with a shelf or bite plane to establish incisogingival relations of advantage, was substituted, being worn at night only. The removable lingual arch wire was left upon the lower teeth throughout the period of secondary treatment. Muscular exercises to build up and increase the functional activity of the temporal-masseter groups and the orbicularis oris were prescribed at the time the case was recorded for the third

time. A fourth and last record of the case was made several years later, showing the dental and facial structures in a fairly satisfactory state of balance. In Fig. 9, the facial growth changes are analyzed.

CASE 4.—*(Fig. 10) (C. V.)—History and Attributed Etiology.*—A young woman aged 20 years, had a satisfactory health record and nothing to account for the definite eugnathic anomaly which she possessed. The soft tissues of her mouth were healthy, and her teeth were free from dental caries. The roentgenographic examination revealed the presence of unerupted third molars, which later had to be removed. There was no evidence of nasopharyngeal pathology, and she was a nasal breather.

Diagnosis.—Both dental arches were too narrow, with the abnormality especially apparent in their frontal portions and evident by crowded and malaligned incisors. A malrelationship existed between the opposing dental arches, the lower teeth being posterior to such an extent that an end-to-end bite existed between the bicuspids and molars. The mandible appeared to be normal in size, pattern, and in its relationship with the rest of the face. The facial muscles were normal in tone and the lips in function.

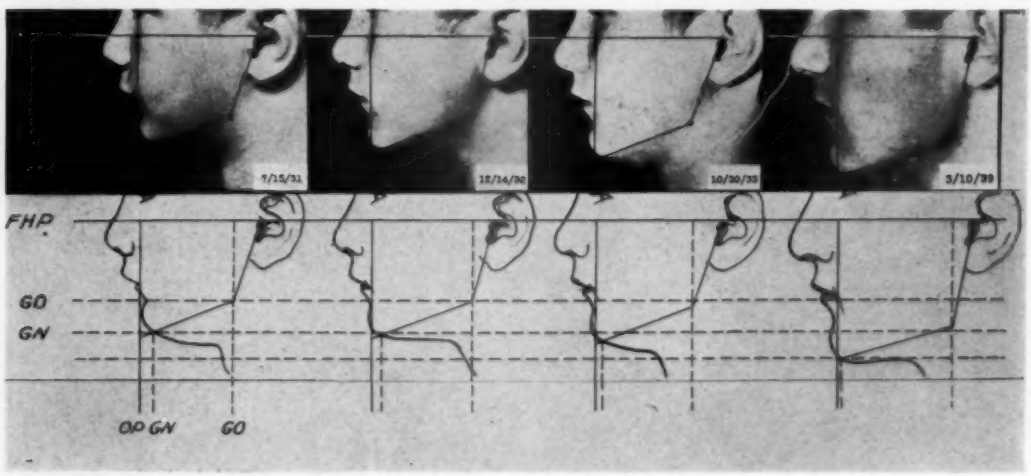

Fig. 9.—An analysis of the facial growth changes indicates a marked increase in both the horizontal and vertical aspects.

Treatment Therapy Employed.—Our objectives in treatment included the restoration of the dental arches to normal form, the teeth to natural alignment, and the correction of the anteroposterior malrelationship. A labial arch wire was utilized upon the upper teeth in the manner already described in the previous reports, except that for purposes of control all the teeth in the front of the mouth, including the first bicuspids, were banded. A removable lingual arch wire was placed upon the lower teeth and supplied with the necessary auxiliary springs. As soon as both dental arches approached the normal in form, intermaxillary pressure was applied, one dental arch, en masse, being pitted against the other, from the standpoint of anchorage.

Results Achieved.—With normal functional relationships established, all active treatment appliances were removed, a cuspid-to-cuspid retainer placed upon the lower teeth, and a Hawley appliance on the upper teeth, the latter

being worn at night only. In studying the facial series (Fig. 10), it will be noted that the only change evident was in the mentolabial sulcus which, to begin with, had been quite deep and gradually became less so as treatment progress was made. The denture reproductions showed quite a pitch in the

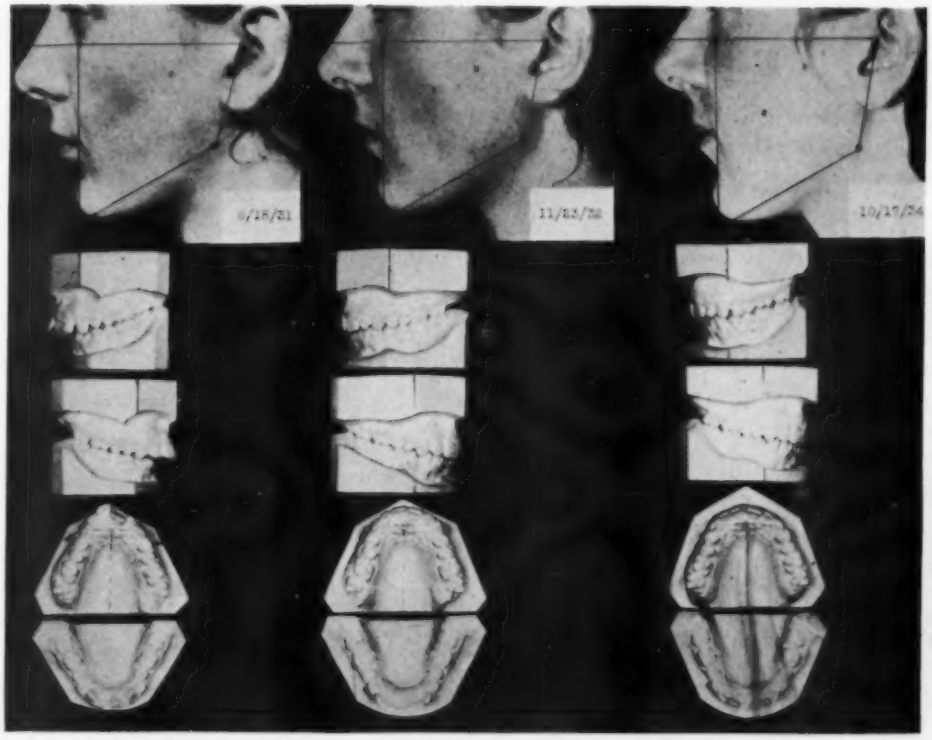

Fig. 10.—Case 4. A series of facial and denture records of a young woman aged 20 years. This eugnathic anomaly should have received treatment ten years earlier.

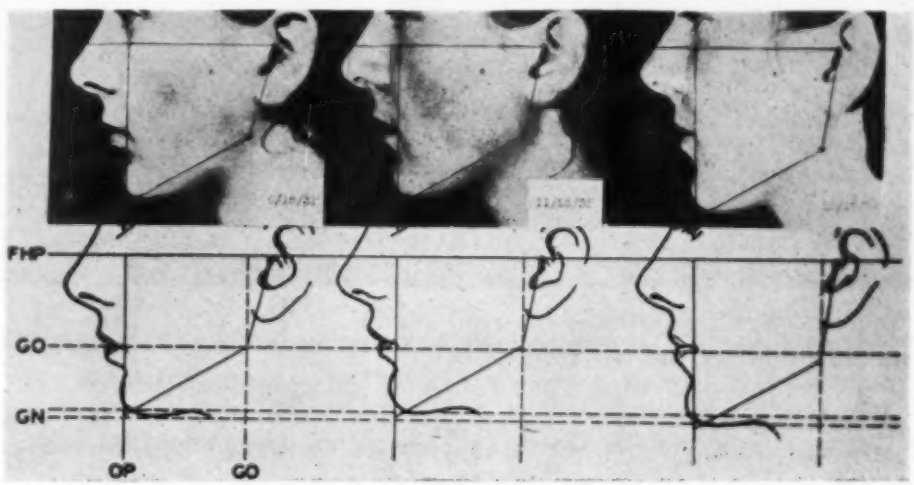

Fig. 11.—Facial records analyzed and showing but one facial change of consequence; i.e., the mentolabial sulcus was less deep than before treatment was inaugurated.

occlusal plane, especially on the left side which, in the beginning, had a greater angularity than the right side. With the teeth in function, the pitch was approximately the same on both sides, a situation which was still in effect

several years later when the last record was made. The anteroposterior position of the upper dental arch, when judged by its relationship to the orbital plane, apparently has not changed its facial relationship. This would seem to indicate that the lower dental arch, en masse, had moved forward. Perhaps this would offer an explanation of the change in the mentolabial sulcus, which is so evident. In Fig. 11, facial growth changes are further analyzed and are of interest because of the age factor.

CASE 5.—*(Fig. 12) (J. C.)—History and Attributed Etiology.*—The patient, a boy, aged 9 years, was in delicate health and had been for a number of years due to chronic asthma. In spite of careful and constant medical care, severe recurrent attacks were recorded during each year. The quality of his teeth was good, and the soft tissues healthy. A roentgenographic examination revealed the normal number of teeth. The tonsils and adenoids had been removed, but due to the asthmatic condition the patient was a habitual mouth breather. No pressure habits were evident, and, in view of the far-reaching effects of his respiratory pathology, this was considered the most potent etiological factor in his case.

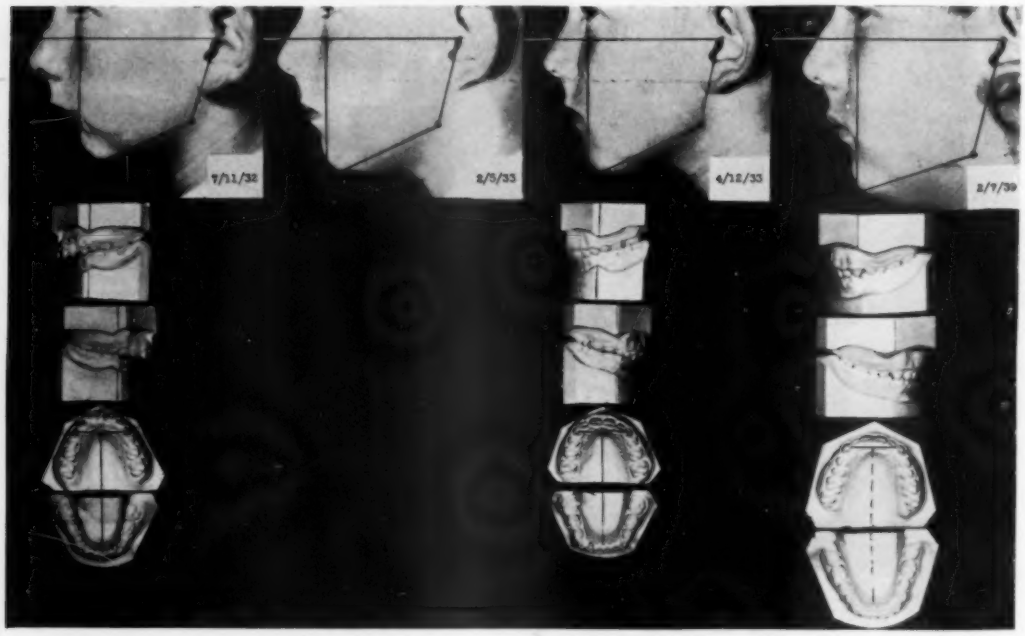

Fig. 12.—Case 5. A series of facial and denture records of a boy aged 9 years. This serious dysgnathic anomaly showed marked improvement as soon as mandibular function was altered and was made to approach the normal.

Diagnosis.—Intra-oral observation and study of the patient's denture reproductions and facial records revealed contracted upper and lower dental arches, protruding and spaced upper incisors, slightly crowded lower incisors, and a malrelationship in which all of the lower teeth and their supporting mandibular structures were posterior to normal. The facial muscles were deficient in tone, and the lips malrelated.

Treatment Therapy Employed.—A labial arch wire was used upon the upper teeth, and, in addition to anchor bands, attachment bands were placed

upon the four upper incisors and the canines. Upon the lower teeth a removable lingual arch wire was placed and stabilized in the manner already described. The first step in treatment consisted in bringing the upper incisors into better alignment (Fig. 12). The upper first permanent molars were then rotated so that, when the lower dental arch was carried forward, the lower first permanent molars could oppose the uppers in an approximately normal manner. Strong intermaxillary pressure was then applied, and the patient was instructed to carry the mandible forward and place it in its normal relationship with the upper teeth. These instructions were so faithfully carried out that within five months marked growth changes had occurred, and the teeth, dental arches, and jaws were approximating the normal relationship. Dental function was then improved through the careful adjustment of opposing tooth relationships, and intermaxillary pressure was eliminated in the daytime and applied at night only. Muscular exercises were prescribed, with efforts directed toward toning up the orbicularis oris and its related groups, and also in retraining the temporal and masseter groups, as well as the pterygoids.

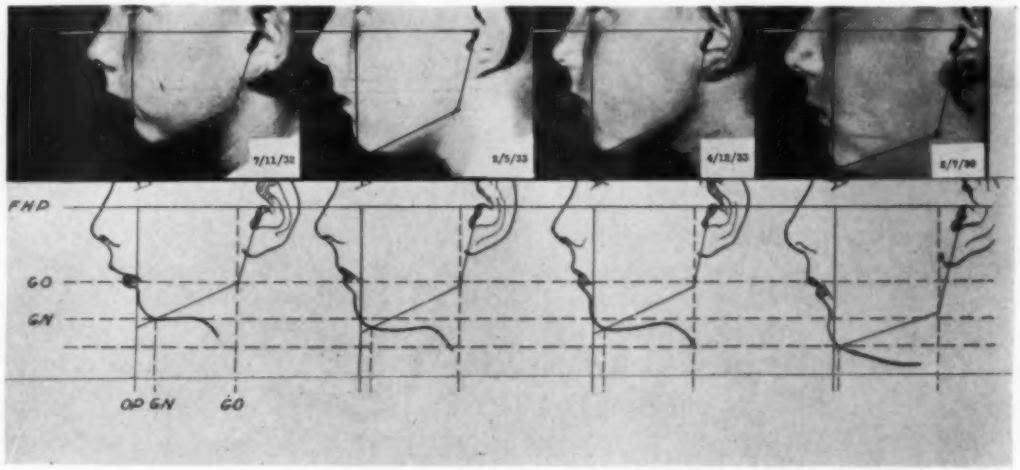

Fig. 13.—An analysis of facial growth changes indicates that hereditary possibilities are being realized.

Results Achieved.—During the period of post-treatment care, a Hawley appliance was used at night only upon the upper teeth, and a cuspid-to-cuspid retainer was placed upon the lower teeth. When last recorded, all permanent teeth, except the third molars, were in place. A roentgenographic examination revealed these progressing toward a normal eruption. In the series shown in Fig. 13, the marked growth changes in the maxillary and facial structures are analyzed. We might easily speculate upon what would have happened in this case had a treatment program been followed which called for carrying the maxillary molars and bicuspids in a posterior direction to establish dental function, regardless of the needs so apparent in the mandible.

This evidence, as well as the other presented in this series, confirm the fundamental biologic principle that form and function are mutually dependent, both in growing processes and in maintaining the equilibrium of bodily parts. It also serves as a verification of Wolff's Law of bone transformation which,

in brief, is "that the external form and internal structure of bone change with every alteration of function"—or, in other words, "the amount of growth in bone depends upon the need for it."

In the study of these five cases, several principles are, in my opinion, given emphasis: (1) an accurate differential diagnosis is necessary; (2) heredity establishes limits, and it is our task to see that they are attained; (3) the treatment policy determined upon and the skill with which it is applied determine the character of the results achieved; and (4) where growth changes of advantage are needed, we must do our part in establishing conditions which will bring them about.

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ANALYSIS OF MALOCCLUSION, BASED UPON THE FORWARD TRANSLATION THEORY

Technique of Correction With the Pin Appliance

George W. Grieve, D.D.S., Toronto, Can.

*"It is remarkable how easily we fall into a particular route, and make a beaten track for ourselves."**

PROBABLY many engaged in the practice of orthodontics today are still following "a particular route," established over forty years ago by the late Edward H. Angle. For a considerable time after receiving my diploma from his excellent school, in 1907, I continued to tread the "beaten track." However, as experience broadened my outlook, I began to discover pitfalls therein, as did some others, including Dr. Angle himself, whose first definite step out of the "beaten track" was taken in 1910, when he introduced his pin and tube appliance as a "working retainer." It was a factory-made mechanism, and the archwire was in three sections, with horizontal round tubes on the molars. Before it was possible to obtain the parts from the manufacturer, I constructed and adjusted it upon a case as an active treatment appliance. I was very enthusiastic about it, and felt that it was going to solve our treatment difficulties, as we sensed them at that time.

The pin appliance did not become very popular, the chief criticism of it being that the exacting technique required for its successful manipulation was too difficult for the average operator. It was our first intricate appliance. Very soon it was discovered that this mechanism had just a few innate weak features, and certain changes were made in it by individual operators, including J. Lowe Young, C. A. Hawley, and myself. Young suggested elliptical vertical tubes for the molars, and made the archwire in one piece, with small vertical loops in front of the molars and between the pins for the individual teeth. Hawley suggested small half-round pins and tubes for all teeth except the molars, and Young introduced soft wire locks for all pins. I never liked the vertical loops in the archwire, and soon eliminated them. Later I began to apply, on individual teeth, large U-shaped springs of much lighter wire, with different forms of attachment, including the regular half-round pin. I also introduced what I call the buccal planes, to stimulate growth of the mandible where that bone is lacking in its forward growth.

In Fig. 1 we see the pin appliance as I have used it in fully 90 per cent of cases for many years. With its U-springs it is particularly efficient in carrying out treatment, with the forward translation theory of malocclusion as the basis for procedure. The technique in its construction and manipulation is certainly exacting, but not beyond the capability of anyone with the mechanical ability necessary to practice orthodontics successfully as a specialist.

Before discussing in detail the technique applied in the use of an appliance, one must first outline the theory of malocclusion upon which treatment is to be

*"Wallace: or Life in the Woods."—A Review in *Reader's Digest*, September, 1940.

based. Most readers of orthodontic literature must have read, and I trust studied, some of my former papers, in which, for many years, I have expressed the belief that the forward translation theory of malocclusion will eventually become established as the universal basis upon which analysis and treatment of malocclusion will be founded.

It is unnecessary to discuss this theory in detail again, as it has been covered so fully in former papers. It has for its basis John Hunter's description of "the growth of the jaws from birth onward," and may be found in full in J. Sim Wallace's book,[1] *Variations in the Form of the Jaws*, commencing at the bottom of page 61. In Fig. 2 we see illustrated Hunter's description of the growth of the mandible. Upon this premise it is definitely evident that in a normally developing denture the maxillary permanent molars never come to occupy any of the space originally occupied by the primary denture, and the mandibular ones only to a very slight extent due to the extra width of the second deciduous molars.

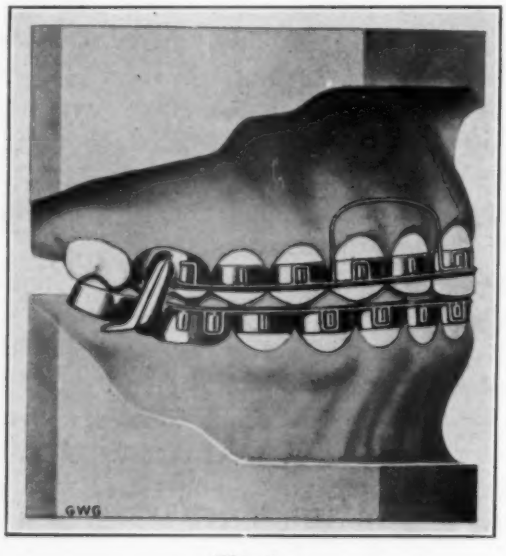


Fig. 1.

About fifteen years ago, basing my belief in this theorem, I went on record as saying that "teeth generally do not occupy a position distal to normal in the bone in which they are located." During the intervening period my chief endeavor has been directed toward proving this proposition, and for several years now I have felt, to my own satisfaction, at least, that I have succeeded. What convincing proof, then, have I submitted? Only the evidence presented in my treated cases, many of which have been reported in the literature. Those who have seen these must admit that they compare very favorably with the best results shown from time to time by other operators. In some of these reported cases there were casts shown which had been made as many as ten or more years after the removal of all appliances, and in most of which no retaining appliances were placed after completion of active treatment. Retention, where used at all in my practice, is limited almost entirely to a Hawley retaining plate in the maxillary arch. For different reasons, as every ortho-

dontist knows, it is not always possible to place teeth exactly where you feel they belong, or at their normal angle of inclination. So, in such instances I may place, as well as the Hawley plate, a lingual wire for a short time upon the mandibular arch. I have not, in the past fifteen years, placed more than a dozen bands, with spurs, to retain rotated teeth; for if all teeth are standing true, and in their normal location, there will be no force to cause those which have been rotated to revert to their original positions. This statement is absolutely in contradistinction to the opinion of Oppenheim,[2] concerning retention, as expressed in "The Crisis in Orthodontia," in which he says, where there have been extensive movements, and particularly rotations, "the time necessary for retention is at least two and one-half years." I feel sure that, covering a period of years, I have published sufficient evidence to prove that Oppenheim's opinion concerning retention is wrong. He further says: "Retention is the most difficult problem in orthodontia, in fact it is *the* problem." My answer to this is that if treatment is properly carried out, the one-time problem of retention disappears. The *real* problem presents during treatment—*anchorage*. In many cases it is impossible to establish within the mouth sufficient anchorage to carry the teeth back as far as is necessary to bring them into harmony with the cranium; we must obtain additional anchorage from the occiput, and many orthodontists now realize this.

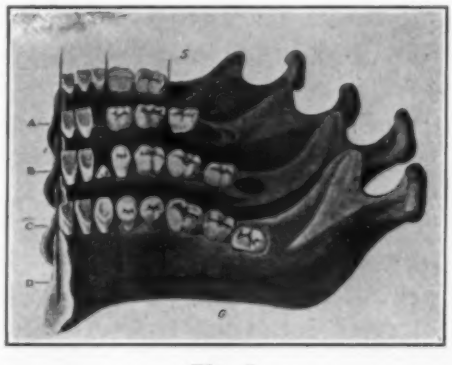


Fig. 2.

I have been very prone to criticize some of the methods and procedures of other operators, but always with an earnest desire to ascertain the truth. When I started to build up in my mind the framework for this paper, I decided, in this presentation, to refrain from this tendency, and to stick absolutely to my own theme. However, when I came to express my thoughts in writing, I realized that only by a free discussion of our theories and practice shall we ever arrive at any degree of unanimity concerning our problems.

I have read, with considerable interest, the excellent paper presented by Hellman[3] before this Society at its spring meeting, in which he says: "There is little comfort in bragging about successes without showing their ratio to failures and the cost in risks at which they are achieved. Our attainments are still bound up with individual skill, individual knowledge, and individual efforts. We are still lacking a uniform and commonly recognized procedure. Indeed, and I am sure that all will agree with me, we are still in need of a reliable scientific background for guidance not only in method of

procedure, but also in point of view. We are still under the impression that orthodontic appliances are growth-promoting stimulants. Some of us even today honestly believe that with the help of mechanical devices it is possible to grow jaws and develop chins. The frequent and indiscriminate use in orthodontics of the terms growth and development has made them so commonplace as to render them almost meaningless. The fact which intrigues me most is that of all problems in orthodontics there is none so constantly and commonly talked about and none so little understood as is that entailed in the process of development."

Preceding this quotation, Hellman speaks of 235 cases of malocclusion which had come to his attention, in his practice, not including his own, "which had been previously treated but not completed." This is a sad picture, and I am afraid all too true, and concerning which Hellman says: "I shall at this time make no attempt to render a detailed account of this situation nor do I intend to furnish a solution to this problem. The solution will have to come from the profession itself. * * * * Perhaps by a concerted effort it may be possible to find a solution to the problem as it exists and discover a way of heading it off." However, in this paper, Hellman did suggest a solution, showing a very credible result at the time of completion of active treatment. Of course, at this stage, we do not yet see the final result.

Acceptance of the forward translation theory of malocclusion, and its intelligent application in analysis and treatment, furnishes the answer to this problem. For many years I have been endeavoring to get the profession to realize this, and until the great majority of us discontinue carrying teeth forward in the alveolar bone, the science of orthodontics is not going to reach the long-sought haven of *universal procedure in treatment*. However, this is a long jump from the "beaten track," and is not an easy, but a sure course. Too many men are prone to line up the teeth in the dental arches, using *simple* appliances, and in so doing permit the teeth to travel the course of least resistance; then they put their trust in the hoped-for growth and development (concerning which Hellman reminds us of how little we know) to complete the work. If the cases fail, and many of them do, these men do not place the blame where it belongs—upon themselves; if they did, they would probably make a greater effort to solve the problem.

Some writers upon this subject claim that every case presents a problem unto itself—that scarcely two cases react alike. Of course they do not, if the basis of treatment is not established upon a sound principle. If we realize that teeth generally are rarely ever too far back, and that lack of growth occipitally has resulted in their forward translation, then our procedure in most cases belonging to Class I will be more or less uniform. While using the Angle classification, I must cite my own view of what constitutes a true Class II case—one where the mandible is short, regardless of the axial cusp relationship. In this group the preliminary procedure is the same as in those cases in Class I, up to the point where the teeth in each dental arch have been placed in normal relation to their apical base, and all interference in the anterior region removed. At this point, by means of what I call buccal planes, shown in Fig. 1, the mandible is "jumped" forward to normal axial relation with the maxilla,

This establishes normal cusp relationship upon every closure of the jaws, and thus produces stimulation which brings about the desired growth in the rami.

In the Class III group we may have a forward translation of the teeth in the mandible, which would be handled in a somewhat similar manner as in the individual dental arches in the other two groups. The maxilla presents a problem somewhat similar to that in the mandible in the Class II group; stimulation must be supplied to bring about its normal growth and development. This is obtained by means of mass anchorage in the mandibular arch and the use of intermaxillary elastics. Forward growth of the whole maxilla must be brought about en masse—not by movement of individual teeth.

Hellman,[3] in his paper previously quoted, sets up some of us, including myself, to ridicule, where he says: "Some of us even today honestly believe that with the help of mechanical devices it is possible to grow jaws and develop chins." It is quite natural that some of us, having had long clinical experience, should now feel assured that bone growth can be brought about by intelligently applied mechanical stimulation, so I am constrained to ask our good friend if he was joking when he threw this gibe at the mechanically-minded members of our specialty. Does he really think that this is impossible? If so, will he tell us, then, what change has come about (and I am satisfied that some change has taken place) in the maxilla in the Class III case, reported in a former paper,[4] and here shown again in Figs. 3, 4, 5, and 6? And what has happened to the mandible in the Class II case, also reported in the same paper,[4] and which we now see here in Figs. 7, 8, 9, and 10? (The profile picture shown here in Fig. 10, and the casts marked *C* in Fig. 7, did not appear in the original paper, for these were not made until eleven years after the removal of appliances.)

Figs. 3 and 4.

In the last sentence of another paper by Hellman,[5] he says: "Unless our streamlined outlook and air-conditioned aims of the present will change materially, orthodontic progress in the thirty years to come will definitely fail to measure up to that of the thirty years just past." Will our good friend, Milo Hellman, please tell us exactly what he would have us understand from this statement?

The development of the science of orthodontics has for years been impeded by the multiplicity of diverse views. Are we never going to reach the unobstructed highway which will carry us to the goal of our ambition—universal procedure in analysis and treatment of malocclusion?

Anent the controversy which has been waging for years between biologists and mechanics (so-called), I would suggest to those sufficiently interested, that they read another paper of mine,[6] in which I said: "Greater progress might possibly result if those men with biologic tendency would place a higher value upon knowledge gained through clinical experience, for from this source we have learned considerable." In this paper the problem was discussed pretty fully, and I feel that, at least, it is worthy of the time necessary to peruse it.

Woodbury,[7] in a paper four years ago, said: "If we knew the tooth positions and relations that nature would tolerate and maintain in the individual, our problem would be well on the way to solution." Many years before Woodbury inferred that we were so lacking in knowledge concerning this problem, some of us, at least, who were not expecting miracles from *growth* and *development*, did know "the tooth positions and relations that nature would tolerate and maintain in the individual."

Fig. 5.

Fig. 6.

Along the same vein, about five years ago, Mershon[8] asked: "Who of us knows enough of the periods of growth, and the direction of growth, to know where teeth belong?" Most of us have very little definite knowledge of "the periods of growth," but many of us now do know something of the "direction of growth" of the dental arches at least, and clinical experience has taught some of us "where teeth belong." How do we know that we know? I feel that my finished results substantiate my claim. It would be unnecessary to ask Tweed of Tucson, Ariz., what proof he has that he knows, for a couple of years ago he showed, at a meeting somewhere, casts of 100 treated cases that were, I venture to say, as fine results as any of us have ever seen. Many of you must have seen this evidence. Much would be added to our knowledge if Tweed would spread his philosophy, and results in his treated cases, more freely upon the pages of orthodontic literature. Also, if Lewis of Detroit were asked how

he knows, he would tell you that intensive study of the immense number of serial casts in the Merrill-Palmer Clinic has convinced him that the forward translation evident in many of these casts throws considerable light upon the problem of etiology of malocclusion. Concerning Lewis' opinion upon this point, permit me to quote from a letter received from him about two weeks ago: "I wish that I might be with you in New York to support you in the good work you have done. You have my blessing, and you can quote me as being in full sympathy with your philosophy. I still say that we are limited in the amount and kind of movement of teeth with any of our present appliances, and if we are interested in esthetics, as well as occlusion, we just have got to extract teeth, especially in bi-maxillary protrusions. Let's not stick our heads in the sand any longer."

Hellman, Broadbent, and others have told us much about "the periods of growth and the direction of growth." So far as growth is concerned, practically all writers now agree that the growth of the jaws proceeds occipitally. The difficulty is that many orthodontists do not apply their treatment upon this tenet, but continue to follow the old "beaten track," which, from excessive traffic for so many years, has become a deep rut, out of which it appears to be difficult for them to extricate themselves.

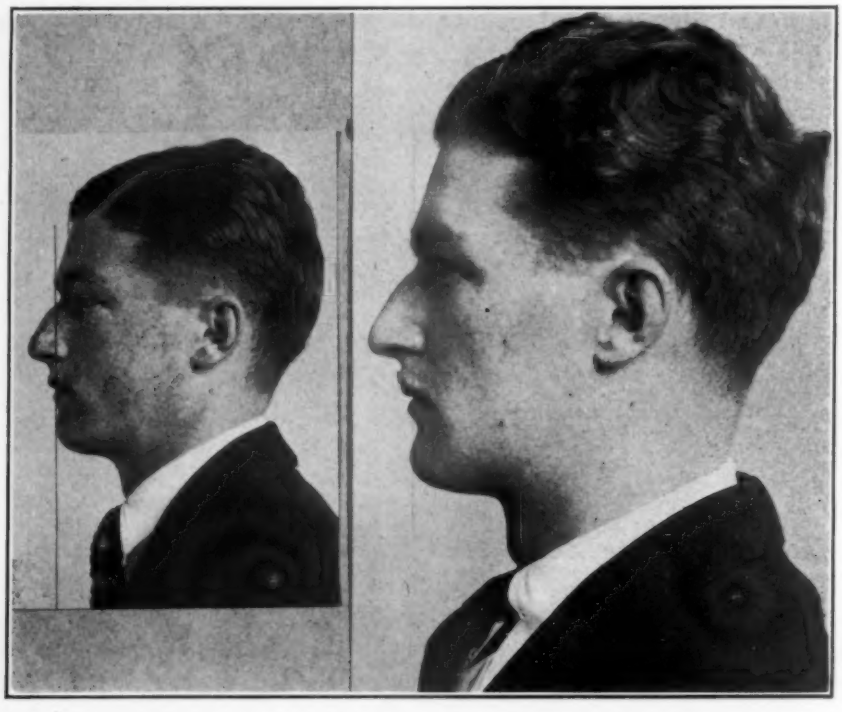
Figs. 7 and 8.

In this preamble I have outlined a theory of malocclusion which is diametrically opposed to that to which many orthodontists have been accustomed, and procedure in treatment, inevitably, differs just as distinctly. I trust that I have been able to give you some idea of the foundation principle upon which my procedure in analysis and treatment is founded. Of necessity, it is impossible here to cover many details in technique which must be carried out, such as the location of landmarks upon the casts, etc., leading up to the analysis and the application of appliances. Those interested may find this technique in detail in a former paper,[6] which may be found in the October, 1937, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, commencing at the bottom of page 970, and ending at the middle of page 972. I would suggest that when the present paper comes into print its readers revert to the former one for this

detail of preparing the casts, for therein are covered many important points, without which this paper is incomplete.

I am very desirous that in this presentation I shall succeed in making quite clear my philosophy, as well as my procedure in analysis and treatment, for I have been told that in former efforts to do this I have not been fully understood.

With properly trimmed and marked casts, as well as full x-rays and correctly posed photographs of the patient before us, we have arrived at the point where a major decision may have to be made. If the deciduous, or mixed denture, is still present, and the malocclusion is one of Class III, or a tendency that way, immediate treatment shall almost surely be indicated. Or if the case is one belonging to Class I, or possibly Class II, and there is not a marked forward translation of the maxillary teeth, nor a definite lack of normal forward growth of the mandible, and the indications are that Nature may, in due course, build basic bones sufficiently large to accommodate the full complement of teeth, then any mechanical assistance necessary may be indicated at once, or



Figs. 9 and 10.

in the near future. In this instance it is very often necessary to carry practically all teeth back somewhat. This is very difficult to accomplish, and requires a great deal of time and painstaking effort, and should be attempted only if the distal movement required is very slight. If, on the other hand, there is a definite forward translation of the teeth in one or both arches, and in some cases a marked tendency to a short mandible, and indications point to difficulty in finally retaining the full complement of teeth, and having them placed in normal relation to the cranium, this is the time to

consider the possibility of eventually sacrificing some teeth, preferably all four first premolars. Often it becomes necessary to wait for some time before we have evidence of the presence, or possible absence, of the third molars. Only in very rare instances do I resort to the removal of a tooth if the third molar in that sector is not present. If the dental arches lack normal width, at any period, and full treatment is not indicated at that time, I would place lingual wires to stimulate lateral development, and quit when the normal width is obtained. The child should then remain under periodical observation until the premolars are erupting, at which period we are nearing the ideal time for commencement of complete treatment.

When at least the first premolars, and possibly the canines, have erupted, it is possible to commence treatment, and we may now proceed to build up the foundation upon which the active appliance will be placed. The decision is made as to which teeth are to carry bands, to which ones the main arch wire is to be attached, and to which the springs. As before stated, *anchorage is our greatest problem*, so we must endeavor to establish all possible from the teeth themselves; and here let me state that I do not consider incisors as anchor teeth. In many instances we shall find it necessary to resort to the occiput for additional anchorage. Some men say that they would not ask their patients to wear such a contraption. In my experience, after thirty years' earnest endeavor, using a very efficient appliance, I find that there is a large percentage of cases which cannot be really successfully corrected without resort to this type of anchorage as an auxiliary.

With the technique which I shall outline, one can usually place teeth absolutely where, in his judgment, they belong, providing sufficient anchorage can be established. Kelsey,[9] in discussing a paper of mine in London, said: "Dr. Grieve had a way of taking the matter out of Nature's hands, and doing the whole thing himself." In truth, Nature does the work, but our stimulation must not contravene her efforts; it must be applied intelligently; otherwise the result sought will not be obtained.

BAND AND TUBE TECHNIQUE

Eventually all, or nearly all, teeth are fitted with bands, carrying vertical half-round tubes, .10 inch long, and placed parallel with the long axis of the teeth. Two tubes, the size usually used for the lingual wire, should be placed upon the buccal surface of each first molar, and often upon the second molars, where present. The tubes for the other teeth are much smaller, and are soldered upon the center of the buccal (or labial) surface. All tubes should be placed the diameter of the archwire gingivally of the occlusal (or incisal) end of the bands, leaving band surface upon which the archwire will rest. All tubes, with the exception of the distal one on the molars, where two are used, may be attached with 18k solder. Detail for the placing of tubes upon the molars will be described in the archwire technique. A tooth which is crowded out of line, and has no space in which to move, need not be banded in the beginning, unless it can be utilized to help build up the anchorage. No spurs are required on bands to correct rotations, as the half-round pins and tubes supply this requisite. It is desirable to have bands for molars as wide as possible, of about

.006 inch in diameter; those for other teeth may be any width the operator desires, and .003 to .004 inch in diameter.

TECHNIQUE OF CONSTRUCTION OF ARCHWIRE AND SPRINGS

The detail of construction of the archwire may be somewhat confusing, because we must take into account three different conditions, any one of which may present, viz.:

1. Where second molars have erupted, these teeth will be the first ones to move; they may require bodily distal movement, or may only have to be tipped back.

2. Where second molars have not erupted, the first molars will be the first to move—either bodily movement or tipping distally.

3. Those cases where it has been decided to remove some teeth, preferably first premolars.

We shall first discuss the procedure for group 1. In these cases there will invariably be required at least some tipping, if not bodily distal movement, of some or all of the teeth. If only the correction of the axial angle of inclination of the second molars is required, these teeth need not be banded, but the archwire should extend far enough back to permit their attachment to it later if this should become desirable. The first pins to attach to the archwire, if the second molars are not to be banded, are those for the first molars. All pins are soldered at right angles to the archwire, and where two are placed for a molar they must be parallel, and far enough apart to permit free application between them of the beaks of a pair of narrow, flat-nosed pliers. The end of the half-round pin wire should have a groove filed in it with a small half-round file (No. 6) to facilitate its correct placing upon the archwire. One may start construction of the archwire from either side, the wire being sufficiently long to reach to the point between the central and lateral incisor, where the two ends will later be soldered. The mesial tube for the molar is soldered to the band about the center of the mesiobuccal cusp. The pin for this tube is soldered to the archwire and fitted into it, outside the mouth, so that there is no play. The archwire is now fitted to the buccal surface of the band, allowing room for the thickness of the flat wall of the distal tube, and then removed from the band, and a tube fitted to the distal pin. The mesial pin is inserted again into its tube, and the archwire so adjusted that the second tube rests against the band. The archwire is now removed from the band, and the distal tube removed from its pin; both tubes are filled with ordinary lampblack, and the pins and archwire in the region of the band covered with the same material. The unattached distal tube is now placed upon its pin, the flat surface of the tube cleaned and flux applied to this surface and to the band where it is to be attached. The mesial pin is now slipped into the tube already attached to the band, and all placed in the flame to solder the distal tube to the band—16k solder. If proper care is taken to prevent solder flowing upon the archwire or pins, or into the tubes, you will have an extremely efficient and snug-fitting molar attachment. Tubes stretch, and pins in time may become loose; to correct this flow a little 14k solder upon the flat side of the pin, and file to fit. Loose-fitting pins do not maintain good anchorage, and this point

must always be kept in mind. The bands for the first molars may now be cemented. All other bands may be placed at any time, either before or after those for the molars.

With all bands on, and the cement set, the construction of the archwire may be gone on with, annealing where necessary. The pins for the molar are inserted into their tubes, and the archwire fitted to the next tooth forward; the center of this tube is now marked lightly with a very fine knife-edge file, the archwire removed and this point marked clearly on the lingual aspect of the archwire, so that the flat side of the half-round pin wire will present to the operator when soldering it to the archwire. Here let us bring out an important point. In marking upon the archwire the point for the center of each pin, be sure that adjacent pins are not placed too far apart; plan to have them, if not just accurate, a bit too close together. Here enters into the technique a very useful little instrument—the *space-feeler,* shown in Fig. 12. This is just a piece of very thin, narrow banding, attached with soft solder to a stiff wire handle (copper does very nicely) about 4 inches long, and about .10 inch in diameter. With this instrument one can *feel* as to whether there is space, or if the teeth are held too tightly together. If there is space, it may be taken up by bending the archwire into the interspace; if too tight, stretch the archwire with Angle's wire stretching pliers. Each pin must be fitted into its tube and, with the archwire free from any interference, check on its fit, which must be snug, but not so tight as to make its removal difficult. The archwire is now adjusted so that the molar pins and that for the premolar fit passively, the axial and buccolingual angles of the pins being parallel with the tubes to receive them. At this point bend the archwire slightly buccally just distal to the premolar pin, so that there is no interference when only the premolar pin is placed, and go on with the fitting to the next tooth forward. The reason for bending the distal end buccally is so that all pins already fitted will not have to be inserted into their tubes each time as the construction of the archwire proceeds. This detail is repeated as each pin is placed, until the lateral incisor is reached. If occipital anchorage is to be enlisted, no pins should be placed for incisors. At least the central incisors should be banded, so that the archwire may have support against the incisal end of the tubes, to prevent its bending gingivally due to the pull of the elastics from the hood. There is a very good and valid reason why incisors should not be attached to the archwire when occipital anchorage is applied—possible devitalization of pulps, as a result of what Oppenheim has called "jiggling." Explanation of this point will be given later. When the construction of both sides of the archwire has been completed, each side is now adjusted, with all pins in the tubes—passive. The two ends are now soldered with 20k to 22k solder—butt joints—between the lateral and central incisors, either on the left or right side. The spur for the traction bar, if occipital anchorage is to be enlisted, is now soldered at the center line. If occipital anchorage is not to be applied on the mandibular arch, the joint in this archwire is made at the center. The whole archwire is now adjusted so as to be passive, and a tracing of it made, as shown in Fig. 11. Soft wire locks are now attached, where desired, with 16k solder. The lock wire for the molars is .025 inch in diameter, and the lock soldered at one end only; for all other teeth the wire is .018 inch and the lock is soldered at both ends.

Where the second molars require distal bodily movement, they should be banded and carry two tubes, if sufficiently erupted to permit this. Sections of archwire for each side should be started, carrying pins for the second molars only, the fitting of which must be done outside of the mouth, as before described. These sections may now be laid away for future use, and the bands for the second molars cemented. (I would like to stress here my belief that it is unwise to attempt bodily distal movement of all teeth, satisfactory accomplishment of which effort requires almost continuous wearing of the hood apparatus, and this is rarely possible. I would attempt it only where the third molars are missing, but would have, preferably, all four first premolars removed.)

Fig. 11.

In group 2 the first molars will be the first teeth to be carried back. The archwire should be started just the same as for group 1, and long enough at the distal end to reach back to the second molar region, the pins being placed for the first molars. This archwire should now be laid aside for use later, and a temporary one made, to extend from the second premolars forward. Springs are placed to carry the first molars back, either bodily or tipped, as desired. When these teeth have been carried back slightly beyond the desired positions, the temporary archwire is discarded and the main archwire, previously started, is completed, and the distal movement of the second premolars started, followed by the first premolars, then the canines and incisors, each being attached to the archwire as they get back to place.

Group 3 embodies those cases where some teeth are to be sacrificed. In this instance the second molars, if present, should always be banded and, if possible, carry two tubes. The first pins to be placed on the archwire will be those for the second molar, after completion of which attachment this band may be cemented. After the cement has set, the band for the first molar, with its mesial tube attached, is slipped upon the tooth, the archwire fitted to locate the point for the mesial pin, which is now soldered. The band is removed and this pin fitted to its tube, then replaced and the archwire fitted roughly. It is again removed and the distal pin and tube placed, as formerly described. Replace the band and adjust the archwire approximately. This band may now be cemented, and after the cement has set the archwire may be completed and adjusted—passive. Now attach a suitable spring to the tooth immediately in

front of the space where one has been removed, to carry it distally. The tooth immediately in front of one being moved by a spring should not, usually, be attached to the archwire, but may be left free to "drag." When springs are in action upon the canines, it will usually be necessary to intrude these teeth, and possibly rotate them, as well as carry them distally and often lingually. All of these movements can be carried on simultaneously. When springs are acting upon the incisors it will invariably be found necessary to carry these teeth definitely to the lingual—very often even at their root ends; occasionally it may be necessary only to tip their crowns lingually. Except in open-bite cases, incisors must almost always be intruded, and in the finished case the ideal overbite is 1.5 mm., and should never be more than 2 mm.

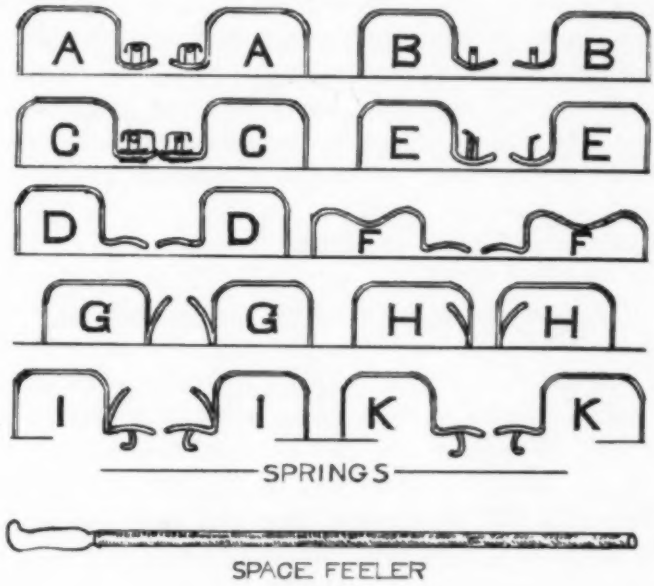


Fig. 12.

The chief function of the archwire is to establish anchorage and obtain general expansion and contraction throughout the whole dental arch, or any part of it. In addition, with it we may obtain intrusion and extrusion, rotations, buccolingual and axial movement of root ends. However, these detailed movements of individual teeth may often be more easily obtained by the application of the U-springs. Great care should be exercised in adjusting the springs, and when this is completed any action desired in the archwire may be put into it. Before it is placed it should have a final check-up, as some distortion might occur in soldering attachments. Any expansion put into the archwire should be marked by additional lines on the chart, as shown outside of the passive tracing. Contraction may likewise be recorded. This chart is kept as a guide, and a fresh one may be made from time to time as the work proceeds.

If mandibular teeth are to be carried back, anchorage should be obtained from the occiput, with an additional traction bar, rather than from the maxilla with elastics, as in Class III, because an attempt to utilize intermaxillary anchorage tends to carry the maxillary teeth forward; it could not always be applied either as maxillary teeth are usually under distal movement at the same time. It is possible to carry out distal movement of teeth in both

arches simultaneously, with the aid of occipital anchorage. An additional hook on each side of the hood, for elastics to the mandibular arch, should be so placed that the elastics will pass below the ears. Strang, Lewis, and possibly others, do not use a traction bar now, but utilize individual wires on each side, made of .040 inch stainless steel, so shaped that they may be attached directly to hooks on the archwire in front of the canines. To the distal end of these wire extensions, which rest outside of the lips, the elastics are attached.

All springs are pretty much of the U-type, and are made of resilient wire .023 inch in diameter. There are several forms of adjustment to the teeth, as illustrated in pairs in Fig. 12. They are attached vertically to the archwire, with 14k solder, usually in the third interspace away from the tooth upon which they are to operate. They are carried gingivally as far as the muscles of the lips and cheeks will comfortably permit, and fitted as close to the mucosa covering the alveolar area as possible without actually touching.

The type most generally applied (*A* and *B*) has a half-round pin attached, of a size to fit the tube into which it is to be placed, with soft wire lock of .018 inch wire, soldered at one end. With this spring we are able to obtain all desired movements at one time—bodily in any direction, or the root more than its crown, rotation, intrusion, or extrusion.

Type *C* has the half-round pin soldered to a short section of thin-wall round tubing, of a diameter to fit the wire spring, loosely, upon which it is slipped. Rotation is possible with this spring, as well as buccal or lingual tipping, and intrusion or extrusion. This same principle may be utilized on the end of the main archwire to tip a molar buccally or lingually.

Type *D* is a simple spring, the end of which rests between the archwire and the tube on the band, to obtain lingual tipping and intrusion. To this type may be soldered a .022 inch round wire pin, as shown in *E*, to enter the tube, which pin fits loosely, and thus you have a spring which will carry out axial and lingual or buccal tipping, and also intrusion. The round pin should be a little longer than the tube, and have a slight bend at its gingival end to catch over the end of the tube to prevent its dislodgment. The direction of the offset of the pin is governed by the direction of the action of the spring. Where there is no band, and intrusion as well as lingual tipping is desired, an occlusal spur may be added to type D, as shown in *K*. Where the buccinator muscle is attached low, a dip may be made in any type of spring, as shown in *F*.

Another type has the free end bent at right angles, horizontally, to pass through the interproximal space, to tip a tooth either distally or mesially—*G* to push, and *H* to pull; the free end is bent to conform to the proximal surface of the tooth to be moved. This type may be used where there is, or is not, a band on the tooth against which the spring is to act. Where there is no band on a molar to be moved, it is often found necessary to attach a bucco-occlusal spur to this type, as shown in *I*, to prevent the spring slipping gingivally. If type *G* or *H* is placed for a premolar, an occlusal spur may, if necessary, be added to rest between the buccal and lingual cusps.

TECHNIQUE OF MANIPULATION OF ARCHWIRE AND SPRINGS

All anchorage possible from the teeth themselves should be incorporated in the main archwire, and upon the original placing of an appliance our first

effort should be directed toward correcting any faulty occlusal relations which tend to cause trauma. Action in the appliance should be light, and the movement of teeth continuous along the line which you want them to travel. Intermittent movement of teeth in varied directions must be avoided. This is the chief reason why incisors must not be attached to the main archwire when even one posterior tooth at a time on each side is being carried distally, with occipital anchorage as an auxiliary. No matter how many teeth are attached to the archwire, a spring on each side, with distal action on a molar, will carry forward, more or less, all teeth so attached, unless there is almost constant auxiliary anchorage from the occiput, which is not possible with most patients. With intermittent application of occipital anchorage there is a slight amount of unavoidable "jiggling"—forward and back. With several of the buccal teeth attached to the archwire, this tendency, so far as these teeth are concerned, is very slight, as the movement is along the line of the dental arch, where the teeth are well supported by bone, and in axial contact with each other. Not so with the incisors, as their movement, if attached to the archwire when the elastics from the hood are not in action, would be labially, where the plate of bone is thin and offers very slight resistance. When the hood is in action these teeth are carried back again. "Jiggling" in this area is very liable to result in root resorption and possible devitalization of pulps. Where there is not sufficient use of occipital anchorage, and the incisors are not attached to the archwire, it will be found that as posterior teeth are being carried back the archwire will gradually move labially away from the incisors. This necessitates decreasing its length in this region from time to time by opening a joint between central and lateral incisors, filing off a little, and resoldering. It will eventually be found necessary to have joints in the archwire on both sides, in order to keep the spur for the traction bar at the center line. Occipital anchorage is necessary in a large percentage of cases, and in practically all where no teeth are removed.

As briefly as possible we shall describe detail of handling the archwire and springs. When moving back molars with springs, each tooth is carried a little farther than will eventually be necessary, in order to allow for some inevitable forward displacement again during the distal movement of the other teeth. Where the second molar has required only slight distal tipping, it may be held in position by a spur from the extended temporary archwire to rest against its mesial surface while the first molar is being tipped back to tight contact with it. When the first molars are back in place, the main archwire, with pins for the first molars, is replaced, and the movement of the premolars is started. If the second molars have been banded, and have been carried back bodily, the archwire originally fitted to these teeth is now applied, with pins to premolars and canines, and springs to carry the first molars back to contact with the second molars. We now go back to the main archwire, which has pins for the first molars. The distal ends of the archwire, with pins for the second molars, are joined to the main archwire, with butt joints at the interspace between the first and second molars. If there is only one tube on the second molar, a pin may be soldered to the extended main archwire and fitted all right, but it is difficult to fit pins to two tubes on a molar in the mouth. However, it is desirable to

have the additional anchorage obtained by having two tubes on both first and second molars. The regular procedure is now gone on with to carry back the premolars, canines, and incisors.

The springs are attached to the archwire either to push or pull, according to the location of the teeth being moved. The most difficult movement to obtain is that of carrying the root ends of incisors lingually. Intrusion is accomplished very easily and quickly. The amount of action in a spring for movement of a tooth along the line of the arch is approximately 2 to 3 mm.; for lingual movement, about 5 to 7 mm.; and for intrusion, about 3 to 4 mm. Variation in the amount of action put in a spring would be governed by its length, the size of the tooth being moved, and whether it is being tipped or carried bodily.

A concomitant factor in many cases of malocclusion is excessive overbite, concerning which problem I have long held very definite views—that it is due to excessive vertical growth of the dental arches in the anterior region, and that establishment of the normal plane of occlusion should be brought about by intrusion of the anterior teeth, rather than by extrusion of the posterior ones. The pin appliance, with auxiliary springs, is particularly efficient in this type of movement, the technique covering which may be found in a former paper,[10] in the August, 1933, issue of the *Journal of the American Dental Association*, page 1412. There are lots of faces where better balance would be established if we could increase, and maintain, the height of the lower third of the face, but it is very doubtful if such increase in height could be maintained if we did succeed in producing it. There are a number of factors which may enter into this problem, but this paper is already too long to attempt to discuss them here. I would call your attention to a paper[11] by Mershon in the June, 1937, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, on treatment of close-bites in which he says: "There is nothing known to science which will correct a true close-bite, either during development or after maturity." He is of the opinion that the muscles play the most important part. Mershon's paper is a valuable contribution to the literature of orthodontics and prosthodontics.

The condition of the dentures in our treated cases, from every viewpoint, many years after removal of appliances, is the best proof of the correctness, or otherwise, of the theory of malocclusion upon which treatment was based; also upon the skill, or lack of it, exercised by the operator.

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2 BLOOR STREET EAST

DISCUSSION

Dr. Milo Hellman.—Mr. Chairman, Dr. Grieve, and friends, I really do not see where the beginning and the end fit together. I think Dr. Grieve could have as well left out the beginning of his paper with great advantage to it. Dr. Grieve is still troubled by the idea that one who is a "theorist" is not a practitioner. I need not defend my share in such thesis. Had Dr. Grieve read another paper besides the one mentioned, which I read at the last meeting of the American Association of Orthodontists in Chicago, he would have been convinced of it. I, too, can show as good results as Dr. Grieve does, and I do *not* have to "translate" or extract teeth for that purpose. This at least is one of the things that can be disposed of definitely in so far as I am concerned. Namely, one *can* be a student and a research worker, and at the same time do decent orthodontics too.

Another thing by which Dr. Grieve is bothered is a tail of something which is wagging in his mind. What I would suggest is that Dr. Grieve read the whole paper and not just the tail end of it. In other words, if it is *dog*, take the whole of it and not just the wagging tail. The paper in which those questions were asked or from which the quotations were made also contains the answers required. All Dr. Grieve should have done was just to read them more carefully. I think the re-reading of that paper will do him good and save me the trouble of repeating it. I believe that re-reading a paper sometimes helps clear up many doubtful questions. Sometimes it is difficult to answer questions satisfactorily today that were asked yesterday. In the progress of science a second answer to a past question is significant only if additional evidence is gathered to support or refute it.

A paper which I read at the two hundredth anniversary of the University of Pennsylvania is of interest in this instance. In it I was obliged to give the natural history of occlusion. I quoted and reproduced an illustration on the evolution of the human dentition presented before this Society in 1916 by Dr. Gregory. After I was through with the presentation, Dr. Gregory said, "Hellman, you were wrong in showing that illustration." I asked him why and reminded him that it was one of his illustrations.

He answered, "Yes, but did we not, two years ago, discover new evidence which made this illustration incorrect?"

Strictly speaking, it is not fair to ask for an answer today to a question of yesterday, particularly when the answer went with it at the time. I don't know but that the demand of Dr. Grieve is rather unjust. If Dr. Grieve had arranged it so that I should read his paper before its presentation today and answer his questions propounded there, this meeting might have profited very considerably. Under the circumstances, I had but entered the building when Dr. Donald Waugh rushed up to say that "Dr. Grieve must see you immediately." I went to him and did not even have time to register. For all I know I have unlawfully entered the meeting. And now I don't know how I am going to get my lunch. One does have to register before lunch time to make sure of it. To get back to my discussion, Dr. Waugh rushed me in and brought me right face to face with Dr. Grieve. Dr. Grieve, very hurriedly but courteously, at once told me that he wanted me to hear in advance what he had to say about me in his paper. At that time, Dr. Eby was reading his paper which I really wanted to hear but was obliged to miss. But I did listen attentively to Dr. Grieve's paper.

I am offering these explanations in the hope that they will help you understand a situation which is really pointless. There is, as I see it, no connection between Dr. Grieve's quarrel with me and the object of his paper. I do not think one can be naive enough to imagine that the void in the paper could be covered over by a grievance even of Dr. Grieve! Thank you!

Department of Orthodontic Abstracts and Reviews

Edited by

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Clinical Appraisal of Growth in Children: By Julian D. Boyd, M.D., *J. Pediatrics* **18**: 289-300, March, 1941.

The physician and the orthodontist cannot depend on his eye and his sense of normality to offer assurance as to a child's degree and rate of growth. Granted that the physician has recorded the child's exact age, height, and weight, what means does he have for evaluating these against each other, against predicted values for other children of similar status, or against the child's own propensities for growth? Numerous formulas have been propounded for these purposes. Some of these are as follows:

The majority of infants born at term will weigh from 7 to 7½ pounds; the body length will closely approximate 20 inches (50 cm.). Under favorable conditions, the infant may double his birth weight in five months or less, triple it by the end of the first year, and quadruple it by the end of the second year. Throughout the period of midchildhood, the average body weight may be approximated roughly by multiplying the age in years by 5 and adding 17, the result being expressed in pounds. The circumference of the head increases most rapidly during the first year, progressively less thereafter. Standard average measurements at 4 months, 8 months, and 1 year are 40 cm., 44 cm., and 45.5 cm., respectively. At two years the usual range of observed normal values is from 47 to 50 cm. The usual measurement at 5 years approaches 55 cm., and there is little growth thereafter. The infant will increase in height by 50 per cent during the first year of life, will have doubled his birth length by the age of four, and trebled it by the age of 13. At the age of 2, he will have reached approximately half of his adult height. From the age of 4 until the acceleration of growth seen at prepuberty, he will grow quite uniformly at the rate of about 2 inches a year.

The foregoing figures and formulas were obtained from the studies of height-weight-age tables similar to those which hang in the offices of most physicians and orthodontists, that were developed from anthropometric data obtained from the measurement of large numbers of children by various workers in different parts of this country, as well as abroad.

The authors of these various studies presented them originally as nothing other than cross-sectional values of observed measurements of attainment. These tables have come into use, however, as representative of average attainment and by implication, as standards of that which is desirable at any age. Many who are engaged in observing the development of children have objected to this

perversion of their data. They recognize that, whereas the data were a true expression of what they had found, the figures could not be interpreted as representative of what might be observed under other conditions. A comparative study of average height in terms of age of the child reveals that observed values vary according to when and where the studies were made, whether the children serving as subjects lived in cities or in the country, the socioeconomic level of the families, the preponderant racial groups represented, and still other regards. In general, evidence indicates that, with greater advantage in living conditions, the average trend is toward larger persons at any given age and also in the adult stature. Racial differences seem dependent more on the manner of life than on genetic factors. Studies limited to children living under superior conditions tend to give values greater than the general average, whereas the reverse is observed with children living under handicaps. The general trend in this country indicates that the rate of growth is advancing, and that in addition, the average ultimate height of the adult is increasing.

These observations do not fit well with a concept that growth is a process which will go on regardless of what we may do about it. Evidently, under some conditions growth can be induced. Are we to assume that the children who manifest the trend toward more rapid and greater growth are living under a disadvantage as compared with those who grow more slowly? Such an assumption is difficult to support. The physician cannot assume that a child is manifesting his optimal rate of growth merely on the premise that his measurements fall within the average observed values. Through recognition of minor interference with optimum growth, the medical attendant may reveal undesirable factors in the child's manner of life, which otherwise might pass undetected.

Growth retardation in the diabetic child is often attributed to the effect of the diabetes mellitus in itself, or to hypothetical associated endocrine dyscrasia. Most frequently it is due to inadequacy of the prescribed dietary regimen.

Retarded growth must not be accepted as inevitable, even when associated with chronic illness, unless all available hygienic means have been employed to promote maximum health and normality of function.

Chronic infectious disease seems to exert a depressing effect on growth, even though no specific derangement of function can be demonstrated. Rather often, children with chronic focal infection are undersized as compared with other children in the hospital wards. It is difficult to establish that the infection, per se, has been responsible for their physical status, for often such children have been underfed as well. However, when indirect measures are used, there is evidence available that chronic infections, even of moderate degree, may serve to depress tissue development throughout the time the infection is active.

It is logical to assume that each person at birth carries with him into the world his own maximum capacity for growth and development in all regards, his limits having been determined by his genetic characteristics and by other conditions prior to his birth. It may be inferred that he cannot surpass these maximum values under any ordinary circumstances. What is the likelihood that he will attain them? This will be determined through the nature of factors which may serve as impediments in his development. To achieve maximum capabilities in all lines of development is beyond reason; to attempt maxi-

mum attainment in certain lines may bring the penalty of retardation along others. Optimum development evades definition; it probably will be different in nature and degree in various persons, and in different conditions of living. The following recommendations are made: In each physical examination of the infant or child, include records of certain specific measurements and data regarding the rate and degree of growth and development. Appraise these against available standards of normality. Do not assume with finality that the child who falls within these standards is developing as well as he may be able to do under improved circumstances. When the infant or child falls below such standards, do not explain away his status without assuring yourself that correctable abnormality of body or of manner of life is not present. Finally, accept standards of growth and development for what they are—cross-sectional averages of children from diverse groups and of varied levels of health—rather than ideals of achievement.

Erratum

On page 285, Orthodontic Section, of the May issue of the Journal, under the heading "Orthodontists Receive Honorary Degrees," the title of Dr. Alfred P. Rogers should be as follows: Dr. Alfred P. Rogers, Clinical Professor of Orthodontics, Harvard School of Dental Medicine.

Editorial

The 1941 Meeting of the American Association of Orthodontists

On Thursday, May 8, the highly successful Fortieth Anniversary Meeting of the American Association of Orthodontists came to a close at the Waldorf-Astoria Hotel in New York City.

In accordance with the precedent established in the past, the first day of the meeting, May 5, was devoted to outdoor recreation. During the morning hours Monday (as a result of the hospitality of New York orthodontists) many of the members enjoyed the unique Campfire Club, 40 miles from the heart of the city. Here amid the background of a virgin forest and trophies of some of the world's well-known explorers and hunters was held the annual trap and skeet shoot of the Association.

During the afternoon of that day many played the golf course on which the National Amateur contest of 1940 was held. The Winged Foot Country Club afforded a delightful afternoon which was climaxed by a gala dinner in the evening. The evening festivities were presided over by the genial President, Henry U. Barber, who was ably assisted by Joseph C. Allen and Ashley Howe. Leuman Waugh in good form acted as master of ceremonies for the evening and directed the presentation of the golf and trap shooting prizes to the various winners of the events. Top honors for members' prize in these events went to William Weichelbaum of Savannah, Ga., for low score in golf and Harry Allshouse of Kansas City, Mo., low score in the trap events.

The scientific program proper started Tuesday morning, following the greeting of welcome and the President's address. The first essayist was Brigadier-General Leigh Fairbank, head of the Army Dental Corps, who presented a paper on "The Responsibility of the Orthodontist in the Treatment of Traumatic Injuries of the Face and Jaws." This was followed by case reports by Lieut. Col. Roy Stout and R. C. Willett. Papers in the afternoon were presented by Allan G. Brodie and Carl Breitner, and a case report followed by Herbert F. Margolis.

Wednesday morning was occupied by the limited attendance clinics given by Brooks Bell, George Siersma, Joseph E. Johnson, Portia Hamilton, L. B. Higley, and Lieut. Col. Roy Stout. The afternoon was devoted to a symposium on cleft palate and crippled children by Herbert K. Cooper and John J. Fitsgibbon, which was followed by a case report by Fred R. Blumenthal, and a paper by Lawrence W. Baker. On Wednesday night was staged the annual get-together banquet and entertainment, which was presided over by the President and an energetic banquet committee. The banquet was followed by dancing and professional entertainment and afforded the usual high spot of the social activities of the annual meeting.

Thursday's program consisted of papers on open-bite by Earl W. Swinehart, diagnosis by Milo Hellman, and orthodontic education by L. M. Waugh.

Thursday afternoon was crowded by the general clinics, which were excellent and enthusiastically received and reflected great pains and preparation.

The evidence and influence of the Preparedness, Lease Lend and Selective Service programs of the government were plainly manifest everywhere. If there was an outstanding theme running through the meeting it could be quickly identified by the casual observer as a changing tempo of orthodontic practice in transition and a tendency to change along with the other great dislocations that are happening in economic as well as professional life.

It was pointed out in discussion and formal essays that the patients of orthodontists who are called in the Selective Service must be looked after by those competent to serve them and that cases must not be allowed to relapse for lack of competent care. This spirit received an enthusiastic response from all who attended the meeting.

Officers selected to pilot the organization for the following year were Claude R. Wood, Knoxville, Tenn., President; Archie Brusse, Denver, Colo., President-Elect; R. C. Willett, Peoria, Ill., Vice-President; Max E. Ernst, St. Paul, Minn., Secretary-Treasurer.

Newly elected committee men were: Judicial Council—R. C. Willett, Peoria, Ill.; Budget Committee—William A. Murray, Evanston, Ill.; Editorial and Publication Board—Stephen Hopkins, Washington, D. C.; Public Relations Committee—Homer B. Robinson, Hutchison, Kan.; Education—George Anderson, Baltimore, Md.; Research—Allan G. Brodie, Chicago, Ill.; Relief—Archie Brusse, Denver, Colo. Joseph D. Eby was elected a member of American Board of Orthodontics. Fredrick B. Noyes of Chicago was honored by being awarded the annual Ketcham award.

The board of directors approved and ratified the following associate editors who had been previously selected by the various constituent societies. The Southern Society has not held a meeting since arrangements were made in which sectional societies select their associate editors.

Dr. Joseph D. Eby, New York Society
Dr. James D. McCoy, Pacific Coast Society
Dr. Paul G. Spencer, Southwestern Society
Dr. Henry F. Hoffman, Rocky Mountain Society
Dr. Charles R. Baker, Central Society
Dr. Richard E. Barnes, Great Lakes Society
Dr. Oren A. Oliver, Southern Society

The society voted to hold its next annual meeting in New Orleans and to make that meeting a Pan-American one inviting all the various orthodontic societies in the Latin Americas to cooperate and attend.

Membership registration for the meeting amounted to 444; in addition to this there were over 80 guests registered, making a total attendance of approximately 530. The total attendance recorded thereby comprised one of the largest congregations ever assembled for a meeting of the A. A. O. during its forty years of existence as an organization devoted to the study of orthodontics.

H. C. P.

News and Notes

Southern Society of Orthodontists

The next meeting of the Southern Society of Orthodontists will be held in Raleigh, N. C., Sept. 29 and 30, 1941.

Preliminary Report of Special Committee Appointed to Send Out a Questionnaire to Determine the Relationship of Orthodontics to the Welfare of the Children of the Nation

It is thought that this report given by Dr. Glenn F. Young, chairman, to the American Association of Orthodontists in New York, May 6, 1941, is of great interest to the readers of the AMERICAL JOURNAL OF ORTHODONTICS AND ORAL SURGERY. It reveals the response of orthodontists to the recent questionnaire that was sent out to ascertain information that might help work out some of the complex problems of orthodontics that will result in the event some orthodontists are compelled to discontinue practice and enter the forces of the United States Army.—Ed.

Of 357 questionnaires returned up to and including May 1, all but six indicated a willingness to assist in carrying on a neighbor's practice in case of emergency.

Naturally New York led in the number of returns with California second, the rest of the replies distributed about according to the orthodontic population of the other States.

The ages range from 25 to 78 with the majority being between 35 and 45.

Only thirty are unmarried and the number of dependents of the married men is about evenly distributed between 1, 2, or 3, with a few having more.

Four men hold reserve commissions in the Navy, 24 in the Army, and 1 in Public Health Service.

Forty-six are engaged in teaching orthodontics, 43 are connected with philanthropic foundations, 27 with state institutions, and 20 with municipal clinics.

17,320 children are under observation, 31,258 under active treatment and 16,801 under retention. Eighty-eight per cent of these are under 18 years of age.

The first few days after the questionnaire was sent out there was a flood of replies, but now they are coming in about the rate of 4 or 5 a day.

In order that the Committee may issue a complete report it is urged that you return your questionnaire as soon as possible if you have not already done so.

Notes of Interest

Dr. Donald S. Sterrett announces the continuation of his practice in the office of Dr. H. M. Covert, 17 Seneca Street, Oil City, Pa. Practice limited to orthodontics.

Dr. Elmer O. Sunderman announces the removal of his office to Suite 405 Hulman Building, Fourth and Sycamore Streets, Evansville, Ind. Practice limited to orthodontics.

Dr. Earl C. Bean, formerly associated with Dr. George H. Herbert, announces the opening of his office in Suite 536-537, University Club Building, Grand and Washington Avenues, St. Louis, Mo., for the continuance of the practice of orthodontics.

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***President*, S. A. Riddett**
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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.

The 1902 Class of the Angle School of Orthodontia, St. Louis, Mo. *1*, M. N. Federspiel. *2*, Albert H. Ketcham. *3*, Willard D. Flint. *4*, Joseph W. Peete. *5*, Martin Dewey. *6*, Rolof B. Stanley. *7*, Norman G. Rooch. *8*, Guilhermena P. Mendell. *9*, Ray Robinson. *10*, Robert Dunn. *11*, Frank M. Casto. *12*, Lloyd S. Lourie. *13*, E. H. Wuerpel. *14*, E. H. Angle. *15*, Richard Summa. *16*, M. T. Watson. (Courtesy of Dr. B. W. Weinberger, New York, N. Y.)